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HYSTEROMYOMECTOMY AND HYSTERO-SALPINGO-ÖOPHORECTOMY BY CONTINUOUS INCISION FROM LEFT TO RIGHT OR FROM RIGHT TO LEFT.*

By Howard A. Kelly, M. D., *Professor of Gynecology in the Johns Hopkins University.*

The field for exsective operations is growing daily more limited, and my sympathy with this conservative movement in gynecology is so strong that I am unwilling even to speak of the more radical methods to be dealt with in this paper without emphasizing the necessity of limiting them to extreme cases. I will therefore briefly review the recent conservative advances made before describing the radical plan of operating.

Radical extirpative procedures will be avoided in a large number of myomatous uteri if the surgeon will carefully study out the relations of the body of the uterus and of the uterine cavity to the tumors; he will then often find that the tumors are so disposed that he may enucleate them by one or more incisions, and save the uterine body intact. This may even be done with interstitial tumors as big as a man's head, and where the fundus is raised in the abdomen as high as the umbilicus. I have in one case taken out seven tumors by as many separate incisions. Cases so treated may be looked upon from a practical surgical standpoint as closely analogous to the long uterine wound closed in a Caesarean section.

The radical method will again be avoided in a large number of the worst forms of inflammatory cases, those in which pus has formed, by my method of free incision in the vaginal fornix behind the cervix, followed by free drainage, without the removal of any organ. An abdominal incision may be required to guide the vaginal hand in breaking up all the pus pockets.

Hydrosalpinx and adherent tubes and ovaries may be treated by breaking up the adhesions, and by splitting open the dorsum of the tube, and dilating its lumen. In such bad inflammatory cases the operator should let the patient definitely understand that she takes some chances as to recovery under this plan of treatment, and may later have to submit after all to the radical operation.

The field left for the extirpation of uterus, tubes and ovaries, after making these important exceptions, is greatly limited. It includes hysteromyomectomy for uteri distorted by myomata, or enormous myomatous masses, where the question of conservation is as yet in abeyance. It also includes hystero-salpingo-öophorectomy for cancer affecting both ovaries, and ovarian cystomata affecting both sides, and old inflammatory cases in which tubes and ovaries are bound down in such dense adhesions that rejuvenation is impossible.

* An address before Southern Surgical and Gynecological Association, Washington, D. C., November 12, 1895.

With these definitions I will now describe an operation which I practise at the Johns Hopkins Hospital, and which I have demonstrated in upwards of two hundred cases within the past two years. Visitors from the American Medical Association may remember some of my cases, operated on in the Hospital Amphitheatre, in May, 1895.

The great value of this operation is its rapidity, saving from 60 to 80 per cent. of the time consumed in the enucleation, and the method of dealing with certain serious complications.

The operation consists in the following steps:

1. Opening the abdomen.

2. Ligation of the ovarian vessels near the pelvic brim, either on the right or on the left side, clamping them towards the uterus, and cutting between.

3. Ligating the round ligament of the same side near the uterus, cutting it free, and connecting the two incisions, in order to open up the top of the broad ligament.

4. Incision through the vesico-uterine peritoneum from the severed round ligament across to its fellow, freeing the bladder, which is now pushed down with a sponge, so as to expose the supravaginal cervix.

5. Pulling the body of the uterus to the opposite side to expose the uterine artery low down on the side opened up. The vaginal portion of the cervix is located with thumb and forefinger, and the uterine artery, seen or felt, is tied just where it leaves the uterus. It is not always necessary to tie the veins.

6. The cervix is now cut completely across just above the vaginal vault, severing the body of the uterus from the cervical stump, which is left below to close the vault.

7. As the last fibres of the cervix are severed or pulled apart, while the body of the uterus is being drawn up and rolled out in the opposite direction, the other uterine artery comes into view and is caught with artery forceps about an inch above the cervical stump.

8. Rolling the uterine body still farther out, the right round ligament is clamped, and cut off, and lastly the ovarian vessels are clamped at the pelvic brim, and the removal of the whole mass, consisting of uterus, tubes and ovaries, is completed.

9. Ligatures are now applied in place of the forceps holding the uterine artery, round ligament, and ovarian vessels; if the surgeon prefers, these may be tied as they are exposed without using forceps.

10. After the enucleation the operation is now finished in the usual way, *a*) by closing the cervical tissue over the cervical canal, and then, *b*) by drawing the peritoneum of the anterior part of the pelvis (vesical peritoneum and anterior layers of broad ligaments) over the entire wound area, and attaching it to the posterior peritoneum by a continuous catgut suture.

The continuous transverse incision should always be started on the side where the ovarian vessels and the ovary and tube are most accessible. If the case is one of a fibroid uterus, and the tumors are developed under the pelvic peritoneum or in the broad ligament of one side, this side should be opened up last, from below upwards, when the tumors can be rolled up and out with surprising facility.

Displaced ureters will not be injured, for on the side on which the enucleation is started such a ureter is pushed down with the loose peritoneum as the uterus and tumors are pulled up and towards the opposite side; and on the other side, no matter how much the ureter is displaced out of the pelvis, as the tumors caught from below are rolled up and out, the ureter drops down with the peritoneum and cellular tissue to the pelvic floor, and the operator need not even see it or be aware of its displacement, to avoid the risk of injuring it.

If the ureter is found to be displaced only on one side, the operation should begin on the opposite side.

To escape the danger of tying the ureter on the side on which the uterine artery is caught after dividing the cervix, I am careful to put the forceps on the artery well above the cervical stump and to tie there.

The abdominal incision is always closed without drainage, by using a continuous catgut suture for the peritoneum, interrupted silver wire sutures for the fascia, a buried continuous catgut suture for the subcutaneous fat, and the subcuticular catgut suture for the skin.

The important points accomplished by this method of operating are *a*) the great saving of time, and *b*) the simple way in which certain serious complications are met.

a) *Time saved.*—According to other methods of operating, half an hour or an hour, or even more, may be consumed in enucleating the tumors and in getting ready to close up the pelvic and abdominal wounds, while by this method the enucleation is often effected in three or four minutes, and in difficult cases in from ten to fifteen minutes.

The experience of every surgeon will bear me out in insisting upon the importance of saving time at this particular stage of the operation, that is, the stage of enucleation, which is most likely, when prolonged, to produce shock, and to be accompanied by excessive loss of blood.

Furthermore, when the enucleation of the disease is completed, all important questions affecting the vital interests of the patient have been answered; adhesions have been severed, important vessels controlled, intestinal complications dealt with, and tumors developed in situations difficult of access have been removed. In other words, those factors in the case which often demand an alert judgment and the highest surgical skill have all been dealt with; the rest of the operation, closing the pelvic wound and the abdominal incision, follows a certain routine which may with safety be left in the hands of a well trained assistant.

b) *Complications met.*—I have insisted particularly upon the novel way in which serious complications are simplified by this plan of treatment, and I would refer chiefly to two kinds of complications:

First, fibroid tumors located under the peritoneum of the pelvic floor, and

Second, inflammatory masses situated behind the broad ligaments, with dense adhesions to the pelvic peritoneum, to the rectum, and often to the small intestines.

In the case of the sub-pelvic peritoneal fibroids, it is astonishing how difficult they are to get at from above, and how easily on the other hand they roll out when handled from beneath by this procedure.

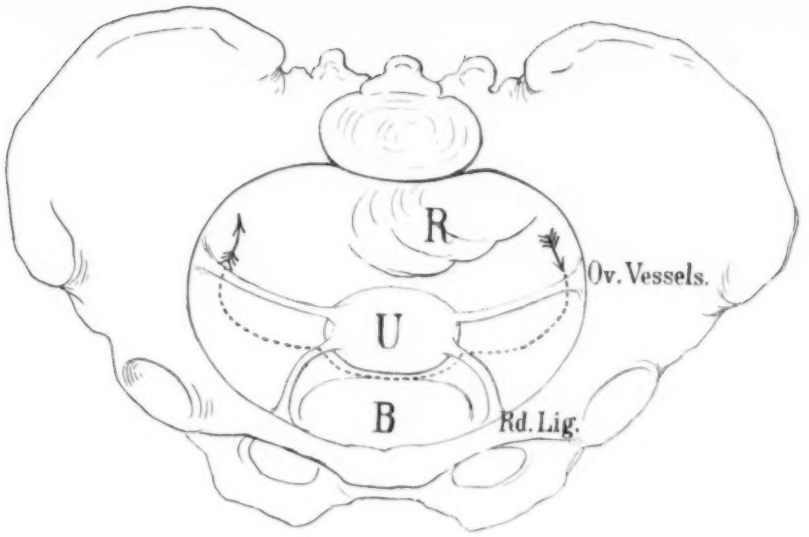

FIG. 1.

Showing line of incision through peritoneum from left to right, through left broad ligament, round ligament, utero-vesical peritoneum, right round ligament, and ending with right broad ligament near the pelvic brim.

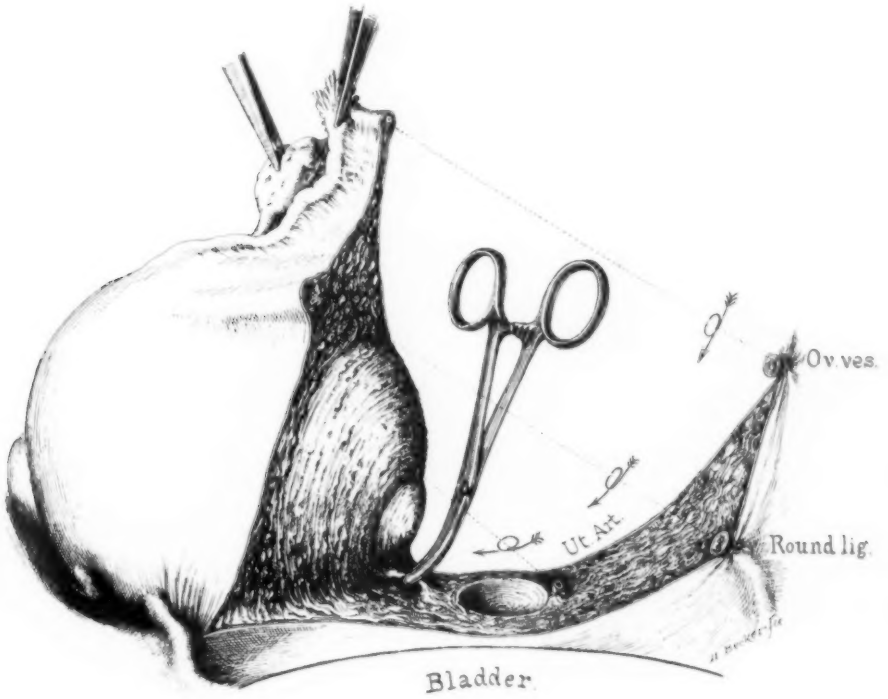

FIG. 2.

Left ovarian vessels tied, left round ligament tied, vesical peritoneum divided and pushed down and left uterine vessels ligated. Cervix amputated and uterus pulled up and out, exposing right uterine artery, which is clamped an inch above the cervical stump. The two following steps are clamping the right round ligament and right ovarian vessels, when the mass is removed.

HYSTERECTOMY SPUD. Used instead of a knife for amputating the uterus at the cervix. The curved blade enables the operator to work easily in a deep pelvis cupping out the stump.

I would say the same of the inflammatory cases. Matted masses adherent in all directions which resist enucleation from above are often removed with ease when rolled up from the pelvic floor from below. The adherent structures seem to be unrolled in a natural and easy way, in surprising contrast to the difficulties experienced, and the injuries inflicted, in gaining the slightest finger-hold in proceeding from above.

To recapitulate: Abdominal hysterectomy by the continuous incision down through one broad ligament across cervix and up through the other broad ligament, is contrasted with hysterectomy by an incision down to the cervix through one broad ligament, and then down through the other, followed by amputation of the cervix.

The special advantages offered by this method of operating are:

1. The saving of from 60 to 80 per cent. of the time in the enucleating stage of operation.

2. The ease with which intraligamentary myomata and myomata beneath the pelvic peritoneum may be enucleated.

3. The ease with which inflammatory masses posterior to the broad ligament may be enucleated by attacking them from below after dividing the cervix.

4. The control of a displaced ureter, on the side last opened up, keeping it out of the way of injury by the simple mechanism of the operation.

THE TREATMENT OF LARGE VESICO-VAGINAL FISTULÆ.*

BY HOWARD A. KELLY, M. D., *Professor of Gynecology in the Johns Hopkins University.*

In the sixth decade of this century the treatment of vesico-vaginal fistulæ was for the first time put upon a scientific basis by the labors of A. J. Jobert, G. Simon, and J. M. Sims.

While Jobert generally succeeded in closing the smaller fistulæ by simply denuding the borders and approximating the edges with sutures, he found that this plan did not succeed with those of larger calibre, where considerable tension was created by the approximation. In order to overcome this difficulty he devised a new plan of treatment (*autoplastie par glissement*), which consisted in deep incisions through the vaginal walls so placed as to relieve the tension on the united edges of the wound.

A deep transverse incision made in the vault of the vagina in front of the cervix, extending even up to the vesico-uterine fold of peritoneum, has been known ever since as the *incision of Jobert.*†

Simon, who followed Jobert, did away with his plan of incising the vaginal walls by using two sets of sutures (*Doppelnaht*). Those introduced at a distance from the margins of the wound were used to relieve tension (*sutures of detention*), and those introduced close to the wound were approximation sutures simply (*sutures of reunion*).‡ In addition to this, Simon devised specula to expose the fistula better, which have never been materially improved upon.

J. Marion Sims, working independently in the same line, devised his speculum for the exposure of the fistula with the patient in the left lateral position; he made a funnel-shaped denudation of its edges extending down to the vesical mucosa but not including it, and then united the wound with twisted silver wire sutures.§

Dr. T. A. Emmet (*The Principles and Practice of Gynecology*, Phila., 1879) and Dr. Nathan Bozeman ("The Gradual Preparatory Treatment of the Complications of Urinary and Fæcal Fistulæ in Women," *New York Med. Jour.*, Oct. 1, 1887) both laid stress upon the urgent necessity of the careful preparatory treatment of cases of large fistulæ by dividing cicatricial bands and using pressure to promote their absorption before undertaking the operation.

In spite of the many successes attained in the treatment of vesico-vaginal fistulæ by these methods, a certain percentage of cases still remained which could not be cured by any known plan of treatment, and it was even found necessary in some cases to resort to a complete closure of the vagina (colpocleisis).

The first active step taken with a view of reaching these inoperable cases was that of A. Martin of Berlin, who covered the defect with large flaps dissected up from the contiguous vaginal walls (*Zeitschrift f. Gyn. und Geb.*, Band XIX, p. 394).

L. von Dittel (*Abdom. Blasenscheidenfistel Operation*, Wien. Med. Woch. 1893, No. 25) opened up a new avenue when he attempted to close a fistula through an abdominal incision; he cut the bladder loose from the uterus and the vagina, freed the fistula from all its attachments, sewed it up and dropped it, and then united the vesico-uterine peritoneum to the uterus and closed the abdominal incision.

A. Mackenrodt of Berlin (*Centrablatt f. Gyn.*, No. 8, 1894) has given us the following admirable plan for the successful treatment of these large fistulæ (*ut sup.* p. 183); the fistula is exposed, the cervix and urethral prominence caught with tenaculum forceps, and the tissue made tense by traction in opposite directions. An incision is made through the vaginal walls in the median line across the fistula. Then with knife and forceps the margins of the fistula are split so as completely to detach the bladder from the vaginal walls on all sides. The separation may be carried as far up as the vesico-uterine peritoneum. The movable elastic bladder is now closed by denuding its edges and drawing them together with fine silkworm-gut sutures. Beneath these a second and even

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* Proceedings of the Johns Hopkins Hospital Medical Society, January 20, 1896.

† See *Comptes-rendus de l'Acad. des Sci.*, 1850. See also *Traité des fistules*, Paris, 1852.

‡ See *Ueber die Heilung der Blasenscheidenfisteln*, Dr. G. Simon, Giessen, 1854.

§ *On the Treatment of Vesico-vaginal Fistula*, by J. Marion Sims, *Amer. Journ. Med. Sciences*, 1852, vol. 23, p. 59.

a third layer of sutures may be placed. After closing the bladder wound in this way, the vaginal wound is approximated as far as the tissues will permit, by denuding its margins, drawing the *corpus uteri* forwards, and passing sutures from side to side so as to bring the vaginal margins together and at the same time to hold the uterus lying upon them in anteflexion. If the margins will not come together they are sewed to the uterus on each side so as to form a firm base in the place of the fistulous orifice.

W. A. Freund (*Eine neue Operation zur Schliessung gewisser Harnfisteln beim Weibe*, Samm. Klin. Vort. N. F. No. 118, 1895) has succeeded in closing two large fistulæ by utilizing the body of the inverted uterus brought through the posterior fornix into the vagina and sewed to the anterior vaginal wall.

E. C. Dudley of Chicago performed a remarkable operation in closing a large intractable fistula by making a semicircular denudation on the inner surface of the bladder extending from one margin of the fistula around to the other. He then attached this denuded surface to the anterior part of the fistula and so obtained a closure. A portion of the posterior half of the bladder was thrown out of use, but the patient had good control over the newly formed organ.

In addition to these five plans, all aiming to reach the same difficult class of cases, I have one of my own to propose. It was carried out in the following manner: The patient, Mrs. Y., aged 40, 5-par., was operated upon, September 25, 1895. She had had a urinary fistula ever since her third labor, eight years ago, and five different attempts had been made by various surgeons to close it, all of them unsuccessful, and with the result of increasing the disability because of the sacrifice of important tissues at the base of the bladder, in fact the base of the bladder was entirely gone. I found the bladder everted through the fistula and filling the vagina with an angry red fungous-like mass; on replacing this, the anterior vaginal wall was seen to be absent, and in its place there was an enormous fistulous opening in the base of the bladder.

The fistula measured 4x3 cm., and involved the anterior lip of the cervix, which was destroyed, as well as the entire neck of the bladder anteriorly (vesico-utero-urethro-vaginal fistula); in front the sharp contour of the cut-off urethra presented a marked contrast to the normal funnel-shaped neck of the bladder. Posteriorly to the right and left of the cervix the ureteral orifices opened on the edges of the fistula. Two or more centimeters of each ureter had evidently been sacrificed in the operations. The vaginal walls forming the margins of the fistula were immovably fixed on all sides and contained numerous radiating bands of scar tissue. There was not the slightest chance of bringing such tissues together by any known method of denudation or suture, so I employed the following method, and covered the defect successfully. The steps of the operation were:

1. A crescentic incision separating the muscular and mucous coats of the bladder from the vagina, was made around the posterior two-thirds of the fistula, and the bladder detached from the supravaginal cervix all the way up to the peritoneum, and widely on both sides, by a blunt dissection. It was easy to avoid injuring the ureters splinted by the catheters.

2. I next denuded a strip around the remaining anterior third of the fistula on its vaginal surface, carrying the denudation down to the mucosa of the bladder and the urethra.

3. Two flexible ureteral catheters 2½ mm. in diameter were passed through the urethra across the fistula, and one conducted into each ureter and pushed up above the brim of the pelvis.

4. The part of the bladder freed from its attachments behind was now easily drawn forward and accurately applied to the immovable anterior third, to which it was united by interrupted fine silkworm-gut sutures. Each suture caught the under surface of the muscular coat of the bladder so as to turn the cut edge up towards the newly formed bladder. The ureteral orifices fixed on this edge were in this way turned into the bladder, and escaped transfixion or compression by the sutures through the presence of the catheters which made their position plain.

I left these ureteral catheters *in situ* three days, draining each kidney directly through its ureter and preventing any urine from entering the bladder to put a strain on the healing tissues. In the first forty-eight hours 900 cc. of urine escaped from the right ureter and 600 cc. from the left.

The wound healed perfectly except at the upper angle on the right, where a minute fistulous sinus 1 mm. in diameter remained, through which a little urine occasionally escaped.

When the patient left the ward she was able to hold 100 cc. of urine in the bladder and did not have to void it more than once in three hours. The raw surface on the anterior vaginal wall was replaced by a firm contracting cicatrix. It is important to note the amount of control secured in spite of the destruction of the neck of the bladder.

My operation differs from that of Mackenrodt in that I do not detach the bladder on all sides and sew it together in the middle of the fistula. It differs also in that I do not in any case include any of the uterus. My plan is easier to apply where the destruction of tissue is so great as to include the upper part of the urethra. It also provides for a detachment of the bladder only in the posterior and postero-lateral portions where such detachment is most easily effected, and then brings the posterior bladder wall into accurate apposition with the anterior vaginal wall.

My plan also differs radically from Dudley's, in that I make no denudation on the bladder mucosa, throwing out of use that part of the bladder lying below the line of denudation.

On the contrary, I utilize all the bladder tissue left by the fistula in freeing the posterior part and drawing it over the defect.

DESCRIPTION OF THE JOHNS HOPKINS HOSPITAL.

BY JOHN S. BILLINGS, M. D., LL. D.

Containing 56 large quarto plates, phototypes, and lithographs, with views, plans and detail drawings of all the buildings, and their interior arrangements—also wood-cuts of apparatus and fixtures; also 116 pages of letter-press describing the plans followed in the construction, and giving full details of heating-apparatus, ventilation, sewerage and plumbing. Price, bound in cloth, $7.50.

HOSPITAL PLANS.

Five essays relating to the construction, organization and management of Hospitals, contributed by their authors for the use of The Johns Hopkins Hospital.

These essays were written by DRS. JOHN S. BILLINGS, of the U. S. Army, NORTON FOLSOM of Boston, JOSEPH JONES of New Orleans, CASPAR MORRIS of Philadelphia, and STEPHEN SMITH of New York. They were originally published in 1875. One volume, bound in cloth, price $5.00.

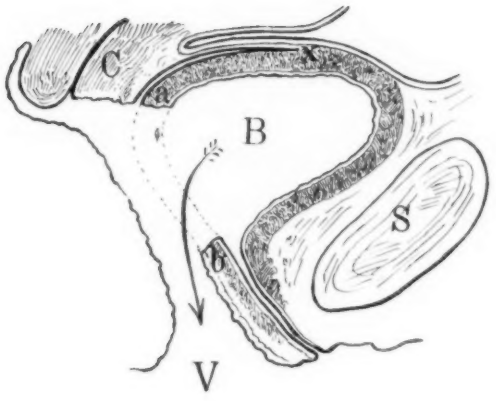


FIG. 1.

The fistula shown in sagittal section, the bladder cut free from the uterus from *a* to *x*.

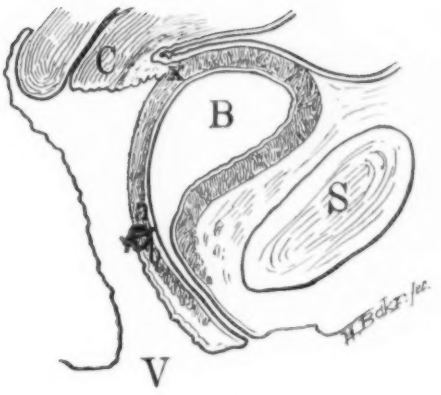


FIG. 2.

The fistula closed by drawing the bladder (*a*) forwards to *b*.

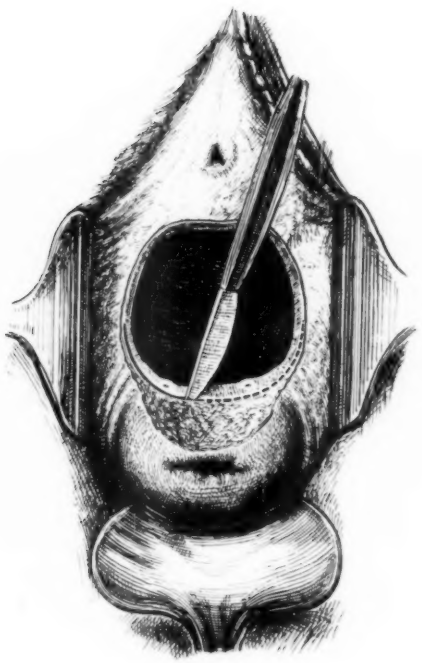


FIG. 3.

The fistula seen from below, the ureteral orifices appear on the posterior margin. The knife is in the act of separating the bladder from the vagina in its posterior two-thirds.

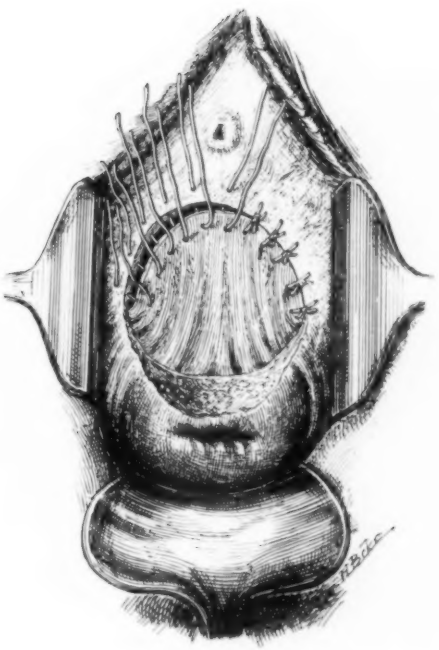


FIG. 4.

The bladder loosened as shown in Fig. 3, drawn forwards and attached to the vaginal surface by interrupted sutures.

NEPHRO-URETERECTOMY—EXTIRPATION OF THE KIDNEY AND URETER SIMULTANEOUSLY.

BY H. A. KELLY, M. D., *Professor of Gynecology in the Johns Hopkins University.*

I had under my care in 1892 and 1893 a case of tubercular kidney and tubercular ureteritis, which came to me through the courtesy of Prof. M. D. Mann, of Buffalo. I operated upon the patient, March 30, 1893, removing the left kidney with its ureter as far down as the pelvic floor, for an advanced renal and ureteral tuberculosis. The operation was described, with photographs, before the Surgical Section of the American Medical Association, at Milwaukee, in May, 1893, but the manuscript was lost and the paper was not published.

CASE I.—The patient suffered from frequent spasms of the bladder of such intensity that she passed most of her time in a squatting posture in bed, screaming with pain, and from being a stout, hearty girl, she had become worn out and emaciated.

A vaginal examination showed the right ureter to be normal, while the left was large, thick, and rigid, apparently about 1 cm. in diameter, and so exquisitely sensitive that only the gentlest pressure could be made upon it. Its surface was also irregular and exhibited depressions at intervals. The enlarged ureter could also be located through the abdominal walls at the pelvic brim, and traced above this point by following a well-marked line of tenderness.

I catheterized the ureters and obtained a few cc. of a clear brown acid urine from the right side, free from abnormal elements, but nothing escaped from the left side after waiting some ten minutes; then upon manipulating the catheter a little, it was felt to pass through a resistant area in the posterior pelvis (ureteral stricture), and suddenly the urine began to flow so freely that in a few minutes about 90 cc. of pale lemon-colored alkaline urine escaped, loaded with pus and containing *tubercle bacilli*.

Upon cystoscopic examination the bladder showed some scattered seed-like elevations in front of the left ureteral orifice.

I determined to extirpate the left kidney with its ureter, and to this end made an incision in the left side 16 cm. long, outside of and parallel to the semilunar line. The muscles were divided, the peritoneum opened, and the viscera displaced to the right, and the posterior peritoneum cut through on the outer side of the colon, which was then further displaced to the right so as to expose the enlarged ureter lying on the psoas muscle. I then traced the ureter up to the kidney, which was cystic; the kidney was slowly enucleated from its bed; the surrounding fat contained a large amount of fibrous tissue and adhered densely to it, especially at the hilum, making the enucleation difficult. The renal vessels were finally tied with four fine silk ligatures and the kidney completely detached. The large hard ureter was next freed from its cellular bed from above downwards to the pelvic brim; about the middle of its course in the abdomen the ovarian vessels were tied.

The detachment of the ureter became more difficult after it was freed from the common iliac artery and vein; at a point 4 cm. below the pelvic brim where the ureter turns forwards, it was surrounded with such dense cellular tissue that I decided not to enucleate any farther, owing to the patient's weakened state; so I tied the ureter on the floor and cut it off, leaving wedge-shaped flaps, and removed the kidney with the entire abdominal portion and one-half the pelvic portion of the ureter.

The mucosa of the lower end beyond the ligature was sterilized with the thermo-cautery and the flaps approximated with six fine silk sutures and dropped.

The abdomen was irrigated with normal salt solution; then with the half hand in the abdomen as a guide, pushing out the thinnest dependent place in the left loin, an incision 3 cm. long was made by pushing a knife through, and a strip of gauze 14 cm. long was laid from the brim of the pelvis down into the loin and brought out. It was not necessary to unite the peritoneal wound beside the colon, because the natural apposition was so good.

The long abdominal incision was then closed with interrupted silkworm-gut sutures. The gauze drain in the loin acted as a vent for some bloody serum, and was removed on the fifth day. When the sutures were removed the union was perfect and there was no suppuration at any point.

The urine, which had persistently contained pus, cleared up at once, and the patient made an excellent recovery. On the eleventh of May I tried to remove the lower end of the ureter, left in the pelvis, by a vaginal incision, but found it impossible on account of the dense cicatricial tissue, which bled actively as soon as it was cut into.

Pathological Report.—The kidney was cystic and tubercular, and the ureter was converted into a large thick tubercular cord throughout.

The following report is from Dr. L. F. Barker, of the Johns Hopkins Hospital:

"The parts removed are the left kidney, with portion of the left ureter.

Weight of mass, 100 grams.

Surface of kidney is irregular, and there are several large protruding cysts, covered by the capsule.

The kidney measures 11x6x3.5 cm.

The largest of the cysts measures 4x5 cm.

The capsule of kidney is thickened, and in places intimately adherent to the surface of kidney substance.

On section, about 65 cc. fluid escaped from the cysts. The fluid in one of the cysts is white and flaky, and consists almost entirely of fatty debris. In another cyst the fluid resembles blood-stained urine. The cysts are found to communicate with the pelvis of kidney, and really correspond to the dilated calices.

The parenchyma of the kidney has been in a large part destroyed. In the central portion there is an area which has largely escaped, in which the cortex has a depth of 7 mm., but elsewhere the substance of the organ is represented by layers of different thicknesses (averaging ½ mm.), spread out over the dilated calices. Even in the less altered portion, the

frozen section shows that there are the same dilated tubules, the epithelium of which is somewhat flattened, besides occasional aggregations of rounded cells.

One or two glomeruli are seen to have undergone fibroid transformation."

Ureter. The ureter presents two points of constriction, respectively 3 and 8 cm. (1¼ and 3¼ in.) from the kidney. The hilum of the kidney was filled with dense adherent fat, preventing dissection of stricture without tearing it.

The ureter is much dilated, more at some points than at others, the calibre of its lumen varying from 1.7 to 3 cm. (¾ to 1¼ in.). Its wall is much thickened, measuring in places from 5 to 6 mm. The mucous membrane is of an opaque buff color, and at one spot, near the pelvis, there is a superficial area of calcification 5 mm. in diameter.

Frozen section of the ureter shows that the epithelium is entirely absent from the surface and that the mucous membrane is converted into a mass of diffuse tuberculous tissue, in which here and there definite tubercular nodules can be made out. The surface is not infrequently quite necrotic and the cells near it have undergone fatty degeneration. The muscular layer has been involved and there are many aggregations of small round and epithelioid cells there. In some places there is cell proliferation in the fibrous layer of the ureter. The connective tissue is from three to four times thicker than normal.

I have heard from the patient this year (Feb. 1896). She is stout and is in excellent health, and goes about everywhere, with but one of her old discomforts, frequency of micturition.

After the preceding operation, April 3, 1893, I secured a male cadaver for the purpose of determining the practicability of removing the entire ureter by an extra-peritoneal operation. I was able to do this easily through a long incision beginning in the loin back by the quadratus muscle and extended forwards and downwards, skirting the anterior superior spine and ending in the semilunar line. The kidney was freed and the peritoneum lifted up, and the entire ureter down to the bladder wall detached, without opening the peritoneum and without cutting a single large vessel. The accompanying drawing is from a photograph in my possession made at the time from the subject by Mr. A. S. Murray.

Case II.—The next case to present itself in which the operation of nephro-ureterectomy seemed to be required was that of Miss P., age 23, a patient of Dr. B. W. Taylor of Columbia, S. C. She began as a child to complain of constant pain and weakness in the back which often compelled her to lie down; at nine years of age she was six weeks abed. She always suffered more or less from an inability to retain her urine, and this weakness became markedly worse after an attack of scarlet fever, when six years old. She received her first treatment when ten years of age, and has continued to need treatment year by year ever since that time. Micturition is frequent and not followed by relief. For four years past she has been obliged to go so frequently that she could pass but a few drops of pale urine at a time, accompanied by pain and strangury. For six years she has had an intermittent pain in the bladder, which within the past year changed to a constant dull ache. A year ago for the first time she had an attack of spasmodic pain in the region of the left kidney, very severe, accompanied by vomiting, and followed by pain in the bladder. Since the first attack she has had many others, often with not more than a week's interval. During such attacks she was compelled to walk about, and when confined to bed was obliged to lie with knees flexed upon the abdomen. Attacks were brought on by fatigue or exposure to cold, and lasted from one to three hours, each attack being followed by an increase in frequency of micturition, and in the amount of urine passed. Since the very first one she has had a constant pain and tenderness in the left groin above the crest of the ilium.

Repeated examinations of the urine showed that it was always acid, amber-colored, contained a marked amount of albumen, and deposited a heavy cloudy sediment. Pus cells were abundant, and hyaline and granular casts were found at almost every examination. Specific gravity varied from 1015 to 1020.

By palpation per vaginam the left ureter was found uniformly enlarged and extremely tender to pressure. It appeared to be transformed into a cord about three times the normal size. On the right side the ureter was normal and not sensitive. There was a distinct spot of tenderness at the pelvic brim about 3 cm. to the right of the promontory of the sacrum. The left kidney could not be palpated.

By cystoscopic examination the general surface of the bladder was found to be normal; the trigonum was injected, showing delicate leashes of vessels. The left ureteral orifice was deeply injected, surrounded by an area of granulations about 2 cm. in diameter, extremely sensitive to touch, and bleeding so readily that the ureteral orifice was at once obscured. It was impossible to introduce a catheter into the left side owing to the obstruction of the orifice by the granular masses. A ureteral catheter was introduced into the right (sound) side *and normal urine obtained.*

It was evident therefore from the examination showing the diseased state of the ureter, together with the history of the persistent pain localized on the left side, and the results of nine separate urinary examinations, that the disease was an infection of the left side, probably tubercular in character, although no positively recognizable tubercle bacilli were found in the urinary examinations.

In view of the manifest thickening of the ureter, shown by the vaginal examination, as well as the efflorescence of disease about the ureteral orifice in the bladder, I determined to extirpate the kidney with the entire length of the ureter, and, if the patient's condition would permit, to cut out an oval area in the bladder, resecting the localized disease there.

The operation was performed, December 18, 1895. Left nephro-ureterectomy for tuberculous kidney and ureter, by an extra-peritoneal abdominal incision.

Operation.—The left side of the mons was shaved, and the whole left side of the abdomen around to the backbone carefully cleansed and shaved. The patient lay on her right side with a pillow under the groin.

The incision commenced just in front of the vertical muscles of the back at the costal margin, and was carried

down towards the middle of the crest of the ilium and then in a gentle curve around the anterior superior spine 2 cm. away from it, and from this point in an oblique line down to the lower terminus of the left semilunar line, an inch above the symphysis pubis.

The posterior third of the incision was made first, and the renal vessels tied and the kidney and upper part of the ureter detached and brought out through it. The anterior two-thirds of the incision were then made in two successive cuts, after first closing the posterior part of the incision.

The first cut made was about 12 cm. long from the margin of the ribs by the quadratus muscle, down to a point just above the anterior superior spine, and extended into the peritoneum, through moderately fat abdominal walls and three thick layers of muscle, down to the subperitoneal fat. This was easily displaced and the peritoneum overlying the descending colon, which came into view, pushed inwards, while the fingers readily searched for and found the kidney in its normal position protected by the ribs. The surrounding fat was then slowly stripped off from the kidney on all sides, exciting a little bleeding from the capsule at one or two points where it adhered, and the kidney was gently drawn down and brought entirely out of the incision. The kidney mass consisted of two portions, a light-colored upper mass occupying about one-thirtieth of its length, but swollen and divided by shallow sulci into several smaller masses, and a deeply congested lower two-thirds which had some of the appearance of normal kidney substance. While holding the kidney, a small amount of fluid looking like blood and pus escaped through a minute opening in the lower part of the organ. The vessels were exposed by dissecting off the fat surrounding them with fingers and blunt instruments; they were unusually small in size, and of two arteries the larger was but 1½ mm. in diameter. The vessels were clamped at a distance from the kidney, which was then cut free, and the vessels, tied one by one with fine silk, were allowed to drop back. The enucleated kidney was enclosed in a gauze bag and held in a towel to prevent contamination of the wound by any of its discharges. The dissection was then continued on down toward the pelvic brim by lifting up the colon and sigmoid, and freeing the ureter with the fingers. This was done most easily by using the fingers to separate the cellular tissue and at the same time pulling the ureter with its attached kidney downwards. The upper part of the wound, with the exception of the upper angle which was left open 2½ cm. for a gauze drain, was now closed by bringing all the muscular and fibrous layers together by means of three silver wire mattrass sutures and two interrupted sutures.

I then continued the incision on down about 3 cm. above Poupart's ligament and almost parallel to it, to terminate it in the mons at the lower end of the left semilunar line. The muscular walls below were quite thin and were soon cut through. At the lower angle of the wound the round ligament was exposed about 3 cm. from its extreme lower end, and 1 cm. below this the deep epigastric vessels also crossed the incision between the peritoneum and the fascia. These vessels were tied doubly and divided. The round ligament was not divided but pushed aside. The thin peritoneum separating the wound area from the small intestines was now pushed aside gently and the external iliac artery exposed skirting the brim of the pelvis with the great psoas muscle above it and the crural nerves and iliacus muscle beyond. Below the artery the external iliac vein was exposed lying flat against the pelvic wall. The ureter was easily dissected out of its bed until the base of the broad ligament was reached, by simply pulling it forward with the fingers without tying a single vessel. The broad ligament formed a distinct obstacle to further exposure of the ureter, because the tissues at its base together with the uterine artery and veins completely covered in the ureter with a firm sharp band. The uterus could not be felt on the median side. By lifting up the broad ligament with a finger between the ureter and pelvic wall, a ligature was passed by means of a needle and carrier to the inside of the finger, while another was passed one centimeter further inside of this, and the uterine vessels cut between them. In passing the first suture I experienced a little difficulty in catching the curved needle and bringing it up in the narrow space between the pelvic wall on one side and the displaced peritoneum on the other, and as I caught the needle to bring it up, the point pricked the external iliac vein, with the result of an immediate oozing of venous blood, lasting a few minutes and ceasing spontaneously; on account of this accident a second suture was passed from behind forwards, in the opposite direction. I was then able after dividing the base of the broad ligament to free the ureter up to its intra-vesical portion, which I recognized by the fact that any further efforts to strip it loose simply served to demonstrate its intimate connections with the bladder walls. At this juncture my assistant, Dr. Russell, put a finger into the vagina. When the end of his index finger rested at the vaginal vault, the tip of my finger in contact with the extreme end of the dissected portion of the ureter lay in contact with its second joint; in other words, I had dissected out the ureter 5 cm. below the vaginal vault.

During the latter part of the operation the patient was lying on her back with a long wound from the lower part of the ribs posteriorly extending down to the symphysis; the upper portion of the wound was closed in its deeper parts, the lower portion remained entirely opened, and the skin incision was not closed at any point. The kidney with its long ureter lay across the lower part of the abdomen to the right side, the ureter entering the wound at its lower angle. I now milked back any fluid in the ureter between two fingers, and clamped the ureter 2 cm. from the bladder, and tied it half-way between the clamp and the bladder with intermediate silk and then cut it off close to the clamp, after carefully surrounding the lower end with gauze to prevent any contamination of the wound in case a little pus should escape. The kidney with its ureter, 23 cm. long, were now taken away.

The lower end of the ureter distal to the ligature was next sterilized with crude carbolic acid applied on cotton, and dropped to the pelvic floor about 5 cm. below the skin surface.

No ligatures were applied in this ureterectomy, at any point between the renal vessels and the uterine vessels. The abdominal walls were closed by silver wire for the muscles and catgut for the fat and skin. A small drain was put in the lower end of the wound reaching down to the pelvic floor. The pulse

of the patient throughout the operation averaged about 136, and she showed marked cyanosis throughout.

The recovery was smooth and uncomplicated.

PATHOLOGICAL REPORT BY DR. HERNDON.

The specimen consists of the right kidney and ureter. The kidney retains its usual shape, but is somewhat enlarged, being 13 cm. long, 6 broad, and 3.5 in its antero-posterior diameter. The upper half is somewhat flattened, dark red in color, except over one or two small pale areas, and is covered by numerous pin-point ecchymoses. On the anterior surface near its upper and outer margin is an oval depression 1.7x0.9 cm. This is surrounded by a zone of ecchymosis, scattered throughout which are a few small yellow tubercles. The surface of the depressed portion is covered by similar tubercles. The lower 3 cm. of the kidney resembles the upper portion and presents a few small tubercles. The remaining portion of the organ is greatly altered in appearance. It consists of a wedge-shaped zone sharply differentiated from the surrounding tissue. Anteriorly it presents a lobulated surface, everywhere studded by minute yellow or translucent tubercles, which are either isolated or occur in small groups. Surrounding the tubercles are numerous pin-point ecchymoses. The corresponding portion of the kidney posteriorly presents a smooth whitish-yellow surface studded with small flattened tubercles.

This portion of the organ is soft and yielding. On section the altered portion of the organ is found to be occupied by four or five caseous abscesses containing thin milky fluid in which caseous material is suspended.

The walls of the abscesses average 2 mm. in thickness. The upper portion of the pelvis of the kidney is smooth and glistening. The remainder presents a few small white tubercles.

Histological Examination: The inner layers of the granulation tissue which form the walls of the abscesses are composed of typical tuberculous tissue, scattered throughout which are a few giant cells. The abscess cavity contains caseous detritus, some of which is clinging to the walls. The tissue in the vicinity of the tuberculous abscesses is greatly altered; some of the glomeruli are partially obliterated by newly-formed connective tissue, others have undergone complete fibrous transformation. The renal tubules where present have an intact epithelium. The connective tissue is markedly increased, and scattered here and there throughout it are numerous aggregations of small round cells, and frequently a tubercle is visible. The pelvis of the kidney is in part involved in the tuberculous process. Sections from the upper portions of the ureter show a slight desquamation of its epithelium and a moderate infiltration of the stroma beneath with polynuclear leucocytes and lymphoid cells. Other portions of the ureter are practically normal. The tuberculous process seen in the kidney has not extended to the ureter. Tubercle bacilli can be demonstrated in the centre of the caseous areas found in the kidney.

Diagnosis: Tuberculosis of the kidney.

CASE III.—Mrs. K. W., age 30; case of Dr. Wishart, of Leitersburg, Maryland; married four years, one child three years ago after a hard instrumental labor. In the puerperium she had chills and fever. She has never been quite well since the confinement, and for a year afterward she was a decided invalid. She had had a constant escape of urine since childbirth, resulting from an over-distended bladder. Her mother died of consumption.

As a child she was delicate; at eighteen years of age she had what was called "inflammation of the womb," and was quite ill for seven weeks, during which the lower abdomen was swollen and painful, and there was considerable fever. Her present trouble began ten months after childbirth, that is, two years ago, in October, 1893; the first symptoms were violent pain over the right kidney, extending around to the front of the abdomen and down into the pelvis, accompanied by nausea and vomiting and chills and fever; the suffering was intense for about twenty-four hours. The attacks have recurred at intervals of about three weeks ever since. She has suffered from frequent and burning micturition, but has never passed any stone or blood in the urine. The urine was examined a year ago and found to contain pus. The attacks apparently had no connection with diets, drinks, or exercise. The burning micturition was noticed only just before and during the attacks. Her hands and feet swelled at times and she was puffy beneath the eyes. Her lips and mucous membranes are of a good color, and she is a large, stout woman, whose appetite and digestion are good.

The attacks of pain began under the right shoulder-blade and extended into the kidney, and were violent from the very onset of the first attack. For the past year she has had them as often as three or four weekly, growing more intense. Pain is aching, cutting, piercing, like cutting into the flesh of the groin; when it was most intense she would throw herself about and lie on the floor screaming with agony; she would frequently break into cold sweats. She was never relieved until the doctor came and gave her morphine in large doses. When the attacks passed off she secreted large quantities of urine.

The examination of the urine.—Amber color, opaque with sediment, acid reaction, marked trace of albumen.

Microscopical examination.—Red blood corpuscles abundant; detritus; a few pus corpuscles.

The amount of urine passed varied from 600 to 800 cc. before operation. The vaginal examination showed that the right ureter was converted into a large thick cord, which appeared to be about 1 cm. in diameter and was exceedingly tender on pressure.

Under cystoscopic examination the bladder was found to be perfectly normal in all parts except for *a red mammilated patch about the orifice of the right ureter.* The left ureteral orifice and its surroundings were normal. A short ureteral catheter was laid in the left ureter and the urine secured showed pus cells, and a percentage of urea, 2.1 for the diseased side, and 2.6 on the opposite side, demonstrated to be sound. Tubercular bacilli were not found in the urine.

Operation.—The patient weighed about 225 pounds, and the fat on the abdominal walls was about 7 cm. thick, adding greatly to the difficulty of the operation; the ribs and the crest of the ilium lay so close together that I was obliged to

make a horizontal incision between them. The incision began in front of the posterior vertical muscles and extended 16 cm. across the abdomen in the umbilical line, reaching almost to the right semilunaris. Numerous bleeding vessels were clamped and tied with catgut. One large nerve with vessels accompanying it was divided between the transversalis and the peritoneum in the posterior part of the wound; this nerve was 2 mm. in diameter and ran down toward the crest of the ilium.

The peri-renal fat was freed on all sides of the kidney, completely detached, and brought out of the incision. By drawing it down over the lower lip of the incision the renal vessels were exposed, with the pelvis of the kidney lying beneath them.

An examination was now made to determine first, whether the kidney was diseased at all; second, whether a conservative operation could be done; and third, whether extirpation was necessary.

The capsule of the kidney became almost completely detached in the simple manipulation necessary to bring it out of the incision. The upper and lower portions of the organ looked like a normal kidney substance intensely congested. At the middle there was a zone 3 to 4 cm. wide where the kidney was greatly thickened, being perhaps 2 cm. thicker than at either end. This zone was of a pale color, slightly lobulated, and fluctuated on pressure, showing the presence of considerable fluid within. The peeling off of the capsule disclosed a markedly granular surface over an area about 2½ cm. in diameter on the anterior surface near the pelvis. A similar irregular depressed area with numerous white granules was also seen near the lower pole of the kidney, surrounded by tissue apparently healthy. The case was therefore one of tubercular nephritis, limited to the right side, as shown by the previous examination of the urine separated from that of the opposite side. The broad affected zone extending entirely through the central portion of the kidney rendered any conservative resection impossible. The renal vessels were therefore clamped in three artery forceps 1 cm. from the kidney, after freeing them from the surrounding fat. Each of the vessels was tied with a silk ligature cut short. The vein, which was 8 mm. in diameter, when flattened out slipped from the grasp of its ligature as it sank back into the abdomen, but the compression of the forceps checked a hemorrhage which would otherwise have been excessive. As it was there was a free oozing from both ends of the mouth of the large vein, but it was fortunately found and caught by the forceps again deep down in the abundant fat under the ribs, and another ligature placed about it, using a needle and carrier without drawing it up. Two other small actively bleeding vessels were also tied in the peri-renal fat.

The kidney and the entire ureter were now removed in the following manner. By pulling on the kidney and ureter, the latter was made tense and easily dissected out of its cellular bed, with the index and middle fingers pushing the peritoneum, the ascending colon, and the *caput coli*, to one side and stripping off the loose cellular tissue surrounding the ureter.

This dissection was carried down to the brim of the pelvis, and the common iliac artery could be felt with the tips of the fingers over its entire length, with the thumb resting on the surface of the abdomen, the end of the thumb reaching the anterior superior spine.

I now freed the ureter down to its vaginal portion by introducing the entire hand into the cellular tissue, at first between the peritoneum and the abdominal wall, then under the peritoneum of the false pelvis, and finally between the peritoneum and the walls of the true pelvis. This blunt dissection with the fingers was facilitated by pulling on the kidney and making the ureter tense. In this way I freed it and followed it forward to the broad ligament. At this point considerable resistance was felt, and the ureter appeared to the touch to pass through a hole with a sharp border in its upper part. Above this I distinctly felt the uterine artery pulsating.

At this point, about 6 cm. from the kidney, the ureter broke; the lower end was at once caught in forceps and held, while by dint of pushing and working in my finger I succeeded in freeing about 2 cm. more of the ureter. Before doing this, however, I put a stout silk ligature over the abdominal end of the ureter, and by means of one hand in the pelvis and the other holding the long outside end of the ureter I succeeded in tying a tight knot about it, just behind the broad ligament, then with a long pair of scissors introduced through the abdominal incision and controlled by the hand introduced into the pelvis in the same way, the ureter was cut off one-half centimeter above the ligature, after taking care to milk back any of its contents and to keep the upper end tight squeezed until it was removed.

The vagina was now thoroughly disinfected, and, with the patient still lying on her left side, I passed two fingers of my right hand up to the vaginal vault, and with my left hand introduced into the pelvis through the abdominal incision, I brought both hands together with nothing but the vaginal tissue between them. I now made an opening in the vaginal vault and brought the end of the ureter through it and clamped it in a pair of forceps, until the abdominal wound was closed, when the vaginal end was removed also.

This opening was made in the following manner: I passed my entire left hand through the abdominal wound down into the pelvis and pressed the index and middle fingers against the right vaginal fornix, at the same time lifting up the uterine artery on the index finger so as to avoid any danger of cutting it; the end of the ureter lay between these fingers. The index and middle fingers of the right hand were now introduced into the vagina (the patient was lying in the left lateral posture) and pressed up against the fingers of the left hand in the abdomen, the palmar surfaces of both hands being turned upwards. The opening in the vault necessary to draw the end of the ureter into the vagina was now made by Dr. J. G. Clark, who introduced a pair of sharp-pointed scissors along my fingers up to the vaginal vault and pushed them through the thin septum, guided by my instructions; he then spread the blades of the scissors and withdrew them, in this way enlarging the hole in the vault to about 2 cm. The opening was situated about 2 cm. to the right of the cervix. The bleeding from this torn wound was venous and slight. With a pair of forceps pushed through the vaginal opening, the ligature attached to the ureter was now caught, and the ureter drawn through into the vagina and held there while the abdominal wound was being closed.

Closure of the abdominal incision.—The whole wound-track was first irrigated with normal salt solution; although the bleeding was slight a drain was put in on account of extensive separation of the cellular tissues, and the fear of the accumulation of the products of a serous weeping. The fascia and muscles were brought together by interrupted silver wire sutures, with a gauze drain in the middle, and the fat and skin were closed by buried and subcuticular catgut sutures.

The condition of the patient was excellent, and the pulse as quiet as if no operation had been performed at all; I therefore did not hesitate to put her at once in the lithotomy position and proceed with the extirpation of the remainder of the ureter per vaginam. The end of the ureter and the hole in the vault were exposed by using retractors and catching the right side of the cervix with a bullet forceps and drawing it strongly to the left side. By pulling on the forceps holding the ureter it was made tense, while I cut down through the vaginal wall, at first at the side between the anterior and the lateral walls, and then, curving the incision forwards under the base of the bladder to a point within one and a half cm. of the end of the ureter in the bladder. The ureter was so diseased that it broke off three cm. below the vault, and I had some difficulty in finding the short end in the tissue by the sense of touch and in grasping it with the forceps. There was a free venous oozing from the cut vagina below the vault. The ureter broke once more, and this time at its vesical extremity, and as I could not find the end again I closed the wound and stopped the bleeding by introducing about six catgut sutures, tied tightly; the hole in the vault communicating with extensive cellular area above was left open for an inferior drain, which was now inserted, pushing a piece of iodoform gauze well up into the cavity, and leaving its end hanging down in the vagina.

The recovery of this patient proceeded without a single unfavorable symptom and she has returned home.

Pathological Report by Dr. Herndon.

The specimen consists of the left kidney and ureter. The lower half of the kidney is 6.5 cm. long, 4 broad and 5 thick. It is for the most part of a dark red color, but on its anterior surface presents three pale, slightly elevated areas composed of aggregations of minute yellow tubercles. The remaining portion of the kidney presents a lobulated appearance, and is 6x4.5 cm. in its various diameters. This portion of the kidney is soft and yielding, and on section is found to consist of three or four large caseous abscesses containing thick, creamy, odorless fluid. The lower half of the organ is in most parts normal in appearance, but at one point contains a caseous nodule 1 cm. in diameter. The pelvis of the kidney is smooth and glistening. The ureter is 19 cm. in length. In the vicinity of the kidney it is 5 mm. in diameter, at its vesical end 9 mm. It is firm and somewhat rigid.

Histological examination: The walls of the abscesses are composed of typical tuberculous granulation tissue, lined by caseous detritus. The tissue in the vicinity of the tuberculous abscesses is greatly altered. Many of the glomeruli are completely hyaline, others are compressed by the greatly thickened capsule. The connective tissue is markedly increased, and scattered here and there throughout it are young tuberculous nodules. The pelvis of the kidney has an intact surface epithelium slightly infiltrated with small round cells. The stroma beneath, however, shows marked small round-celled infiltration. Sections from the upper and middle portions of the ureter are also slightly infiltrated by small round cells. The ureter in the vicinity of the bladder, although dilated, is little altered. The ureter throughout its course shows no trace of the tuberculous process. Tubercle bacilli were found in the wall of the caseous areas in the kidney.

Diagnosis: Tuberculosis of the kidney.

The diagnoses were made in these cases by symptoms, by palpation, by inspection, and by the analyses of the separated urines.

The patients all presented a history of pain in the side, extending down the course of the ureter and accompanied by frequent painful micturition.

In the first case the renal symptoms were masked by the strangury in the bladder.

In the second case the intense pain in the left side, and in the third case, in the right side, accompanied in both cases by attacks of intense renal colic, pointed towards the chief focus of the disease.

By palpation in all cases the pelvic portion of the ureter was found to be enlarged and thickened, but only in the first case did it show any nodular enlargement. There was also in each case a point of tenderness at the place where the ureter crosses the pelvic brim. It was also shown by palpation that the ureter of the opposite side was normal.

By inspection the bladder was shown to be normal excepting around the orifice of the ureter on the diseased side, where there was a reddened granular mammilated appearance.

The separated urines showed that the abnormal constituents of the urine came entirely from the side indicated by this appearance in the bladder, and that the opposite side was sound.

Tubercular bacilli were found in the first case after a patient search; in the second case bacilli, undoubtedly tubercular bacilli, were found which had some of the characteristics of the smegma bacillus. In the third case no bacilli were found and the diagnosis depended upon the history and the physical examination.

The only case I know of in which an entire ureter has been removed is one in which it was taken out piecemeal by two different operations, following the removal of the kidney. This operation is called a ureterectomy by Dr. Reynier, the surgeon, and is not a nephro-ureterectomy as here described. The case was reported to the Surgical Society of Paris, February 15, 1893, and reported in *La Sémaine Médicale*, February 24, 1893, Vol. I, No. 8.

The patient was a man twenty years of age, from whom Dr. Reynier had removed the right kidney, April 27, 1892, for a uretero-pyelo-nephritis. At a later date he took out five inches of the ureter by enlarging the lumbar incision; in spite of this the man continued to suffer, and the effort was then made without success to reach the pelvic end of the ureter by a para-rectal incision. Later he made a suprapubic

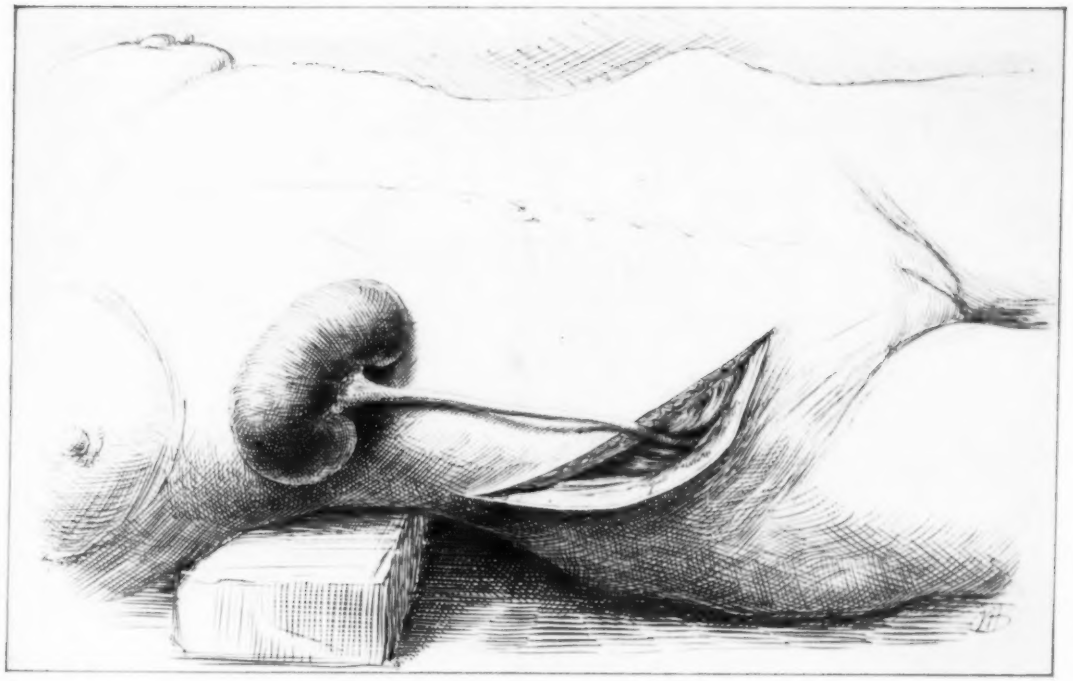


FIG. I.—EXTRA-PERITONEAL NEPHRO-URETERECTOMY.

Cadaver with kidney detached and entire ureter separated down to its vesical extremity through the incision shown in the cut, without opening the peritoneum at any point. April, 1893. (The cadaver used was male.)

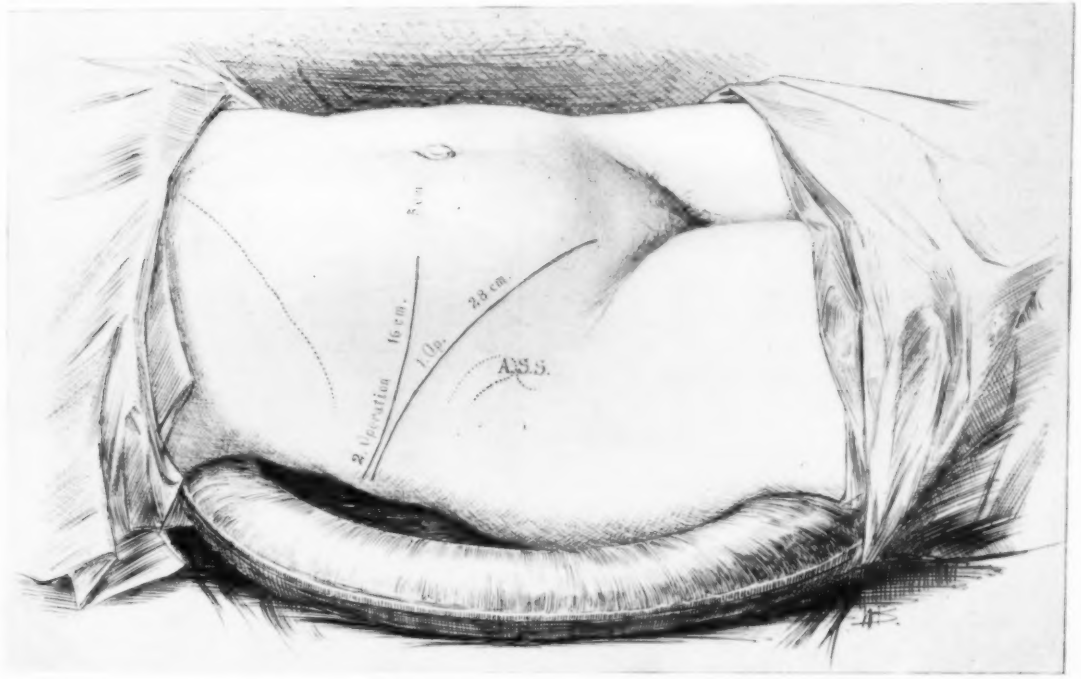


FIG. II.—Diagram showing positions of incisions for extra-peritoneal nephro-ureterectomy in Cases 2 and 3. The long incision was made in Miss P., and the short incision in Mrs. W.

FIG. III.—Case 3. Mrs. W. Transverse incision. Kidney, girdled by tuberculous zone, brought outside; vessels exposed in front and ureter behind.

FIG. IV.—Case 3. Mrs. W. Renal vessels divided and ureter freed down to the brim of the pelvis. The object of this picture is to show the ease with which the entire abdominal portion of the ureter can be palpated through a horizontal incision, with only a part of the hand introduced.

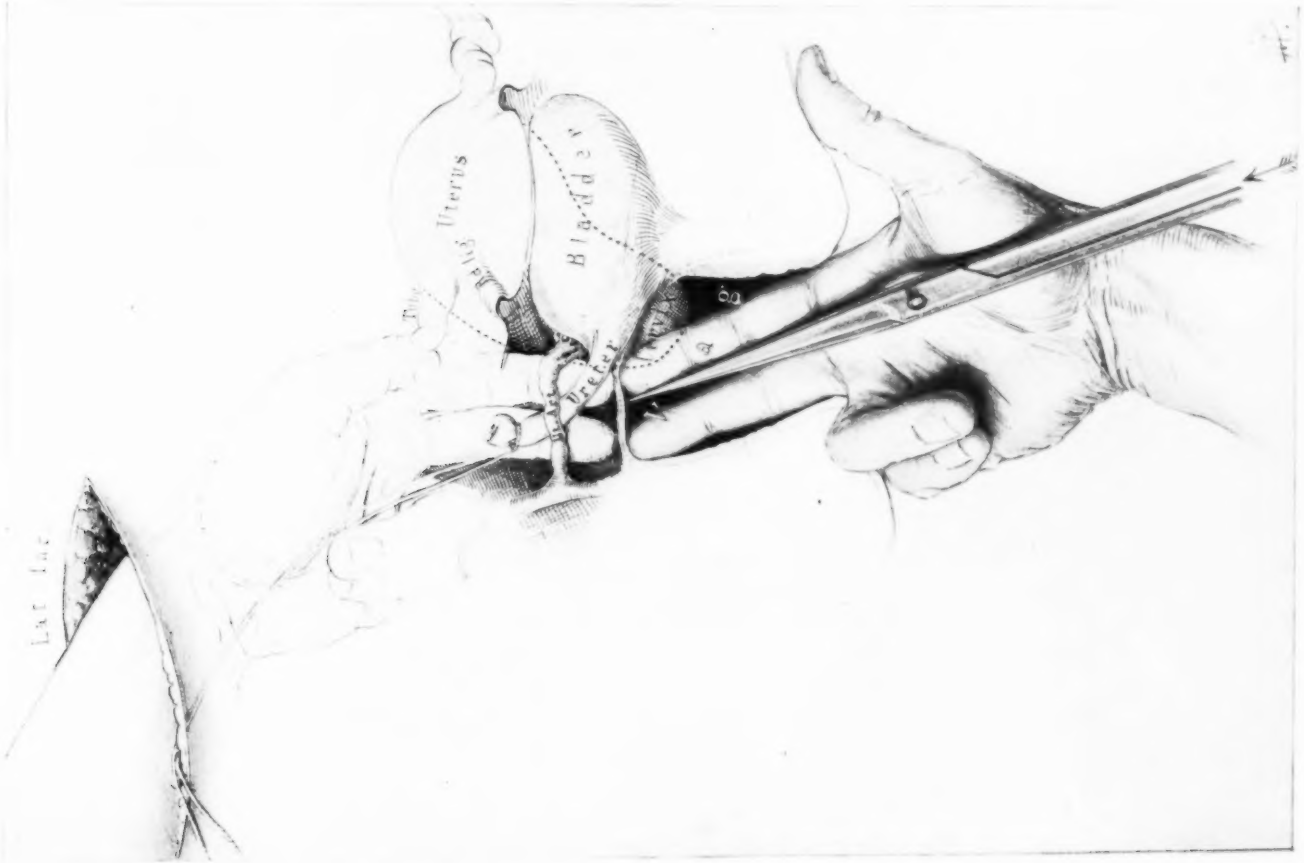


FIG. V.—Opening the vaginal vault to bring the extremity of the right ureter through; the patient lies in the left semiprone posture, and the left hand is carried through the lumbar incision behind the peritoneum down to the right vaginal fornix; the uterine artery is held up on the index finger. The right hand is introduced through the vagina to the vault. The assistant then pushes the scissors through the vault guided by the operator.

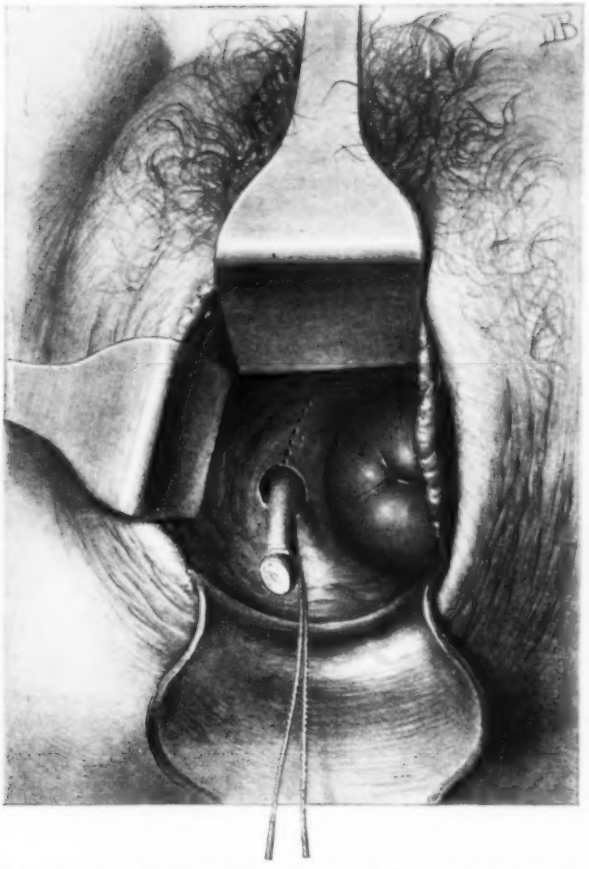


FIG. VI.—Removal of the lower end of the ureter through the vagina. The ureter is pulled into the vagina through the puncture made in the vault by the scissors; this opening is continued forwards in the direction of the dotted line, and the entire ureter is removed.

incision parallel to the inguinal canal, exposed and removed the lower end of the ureter five inches long, and the patient recovered completely.

In this way three different operations were done. It was not a nephro-ureterectomy such as I am describing here, in which a kidney with a large portion or all of its ureter is removed at one sitting.

The three cases whose histories I have given exhibit three different ways of removing the kidney with its ureter.

First, transperitoneal, that is, through an incision through the abdominal wall opening the peritoneal cavity; this incision involves the necessity of a second incision through the peritoneum, covering the posterior abdominal and pelvic walls, in order to get at the ureter.

Second, retroperitoneal, the extirpation of the kidney and ureter through a long abdominal incision beginning in the loin and extending downwards and forwards and ending somewhere in the neighborhood of the symphysis pubis. By this method the peritoneum is detached from its cellular connection with the abdominal and pelvic walls, lifted up, and the ureter exposed without opening the peritoneal cavity.

Third, retroperitoneal, by a short abdominal and a vaginal incision; by this procedure the kidney is detached and the ureter freed from all its connections through a short incision in the loin, as far forward as the base of the broad ligament. The rest of the ureter is then pulled through an opening made in the vault of the vagina, and removed down to its vesical end by continuing the vaginal incision forwards towards the neck of the bladder.

Two of my friends, Dr. Clinton Cushing, of San Francisco, and Dr. C. P. Noble, of Philadelphia, were present when I performed the second operation. Dr. Cushing suggested removing the ureter through the vagina, and Dr. Noble suggested removing the upper part of the ureter with the kidney through the incision in the abdominal wall, and at a later date taking out the pelvic end of the ureter. This was what I had tried to do in the first case, but I failed on account of the dense inflammatory tissue surrounding the lower end of the ureter.

I look upon the three cases as evolutionary in respect to the best mode of operating, and I would prefer in the future in all cases to operate by an incision in the side large enough to take out the kidney and easily admit a hand and fore-arm introduced for the purpose of detaching the ureter as far down as the vaginal vault. I would then tie the ureter at the lowest point, and remove all that portion with the kidney above the ligature. I would complete the operation by removing the vesical end of the ureter through the vagina, with the patient in the lithotomy position.

TEN CASES OF CANCER OF THE UTERUS OPERATED UPON BY A MORE RADICAL METHOD OF PERFORMING HYSTERECTOMY.

BY J. G. CLARK, M. D., *Resident Gynecologist, The Johns Hopkins Hospital.*

Since my report of two cases of cancer of the uterus subjected to a more radical method of performing hysterectomy,* eight cases operated upon by Dr. Kelly and myself have been added to this number.

A review by Dr. Russell of the clinical course of cases of cancer of the uterus operated upon by the vaginal and combined vaginal and abdominal methods, in the Johns Hopkins Hospital between October, 1889, and October, 1895, furnishes valuable data concerning the percentage of recurrence, the inherent tendency of cancer of the uterus to remain localized and not to become metastatic, and its certainty to recur if not widely excised.

The results of Dr. Russell's studies are in the main confirmatory of those of Winter and others, and are a most important and conclusive evidence of the necessity for a more radical operation than any heretofore proposed.

With regard to mortality and regionary recurrence, in 37 cases of cancer of the cervix, the results were as follows: 10 per cent. died from the immediate effects of the operation, 38 per cent. died with recurrence, 5 per cent. were not heard from, and 43.2 per cent. were still alive after a period of one to five years.

In none of the fatal cases could a distinct history of metastasis to other organs be elicited, but all died from local recurrence.

This clinical observation is further substantiated by the records of ten autopsies on inoperable cases, made in the Pathological Department of the Johns Hopkins Hospital, which show metastases in only one case beyond the pelvic and retroperitoneal lymph glands.

In four cases there were carcinomatous deposits in the pelvic and retroperitoneal glands; and in five cases, notwithstanding the most extensive local involvement, there were no metastases.

It is not my purpose at this time to go into the pathological aspects of this question, and these brief statements are only made to point to the necessity for a more radical operation.

The systematic steps laid down in my first article remain practically unchanged, notwithstanding the introduction of certain modifications which have been found necessary for the most complete eradication of the disease in the course of the operations in the eight cases now reported.

The operation is not an easy one, and every detail should be worked out on the cadaver before it is attempted on the living subject.

It requires at least two hours and a half for completion, and on account of the close proximity to the great vessels in the pelvis, especially the external iliac veins and arteries, which must be preserved from injury during the course of the

* See July-August BULLETIN, 1895.

excision of the broad ligament, is tedious and involves the most painstaking care if the best results are to be obtained. If the operation is carried out properly in all of its details, especially those relative to the dissection of the uterine arteries and ureters, the field of operation must be perfectly illuminated either by the brightest sunlight or a good electric light. The close anatomical relations of the bladder and rectum to the uterus necessarily preclude the possibility of any operation if the cancerous process has invaded either of these organs, but fortunately the tendency of this disease is to extend laterally into the broad ligaments before it invades the walls of either the bladder or rectum, and notwithstanding the rather extensive involvement of the broad ligaments, the operation promises good results if the cancer has not extended outside of its cervical limits anteriorly or posteriorly.

So far we have had no death from the immediate primary effect of the operation, and this result is attributable to the great care observed in immediately checking all bleeding, and preventing shock by keeping the patient warm during the operation, and injecting normal salt solution beneath the breast and into the rectum at its close.

Before referring to the eight additional cases operated upon by this method it is necessary to repeat the summarized steps of the operation as laid down in my original article, making a brief commentary upon the various steps, with especial reference to the modifications which have been added.

Summary of Steps.

1. Insert bougies under the local effects of cocaine, to save time and conserve the patient's vital powers for the operation.
2. Place patient in the Trendelenberg posture and make abdominal incision of sufficient length to insure free manual movements.
3. Ligate upper portion of broad ligament with ovarian artery; divide vesico-uterine peritoneum around to opposite side; push bladder off, and spread layers of ligament apart, exposing uterine artery.
4. *Dissect uterine artery out for 2½ cm. from uterus beyond its vaginal branch, and tie.*
5. Dissect ureter free in the base of the broad ligament.
6. Ligate remainder of broad ligament close to iliac vessels and cut it away from its pelvic attachment.
7. Carry dissection well down below carcinomatous area, even though cervix alone seems to be involved.
8. Proceed on the opposite side in the same manner as on the first side.
9. Perforate vagina with sharp-pointed scissors, making strong traction on uterus with small vulsellum forceps so as to pull the vagina up and make its walls tense, then ligate in small segments (1 cm.), and cut each segment as it is tied.
10. Insert iodoformized gauze from above into raw space left by the hysterectomy; draw vesical and rectal peritoneum over this with a continuous fine silk suture.
11. Irrigate pelvic cavity and close abdomen without drainage.

In the first case reported it was found impossible to insert the bougie into the ureters, and it became necessary to proceed with the operation without this valuable aid.

Cases occasionally occur in which it is very difficult or impossible to insert the bougies or catheters, and it is well to know in what way to proceed safely with the radical operation in the face of this obstacle.

Under these circumstances the time consumed by the operation must of necessity be greater, as the most careful dissection is required to avoid ligating or cutting the ureters.

If, however, Steps 4 and 5, as above given, are carefully followed the ureters can be avoided safely, and a thorough operation can be performed.

In cases in which the uterus has undergone senile changes, the uterine artery may be small and rather difficult to locate. To facilitate finding this vessel in such cases, a little manœuvre which was adopted in one case will be of great assistance.

After exposing the intraligamentary cellular tissue (Step 3), the leash of vessels which radiates from the common trunk of the uterine artery and enters the loose cellular tissue lateral to the uterus is included in one ligature, when the artery back of this point at once becomes distended, turgid, and stands out quite prominently.

The dissection is then carried down along the course of the vessel, with the handle of the scalpel (Fig. I). In this way there is little danger of injuring the vessel, and by confining the dissection closely to the artery it is safely carried over the ureter, which appears as a glistening cord, to the internal iliac artery, where it is doubly ligated and cut.

By watching the ureter for a few seconds its identity is perfectly recognized by the characteristic rhythmical passage from above downward, of peculiar serpentine waves, first noted by Dr. Kelly. The ureter is then barred through its course in the broad ligament, and no fear need be entertained concerning the impairment of its nutrition by a close dissection, as it carries its own vessels. When the ureter is freed it can be lightly drawn out of the field of operation by a traction ligature while the operation is continued, or in some instances a more feasible plan is to push it out of harm's way against the pelvic wall.

The operations performed without the assistance of the bougies in the ureters can be made very thoroughly, but are infinitely more difficult, and are impossible in patients where the abdominal walls are thick and the pelvis deep.

There is the greatest comfort in having the danger of injuring the ureters completely eliminated from the operation by the presence of the bougies, which can be felt distinctly as solid bodies whenever it is necessary to determine the exact location of the ureters. The object of the careful dissection of the uterine artery (Step 4) is two-fold, first, to permit a complete excision of the broad ligament, and second, to render the operation bloodless.

It has been found expedient to modify Steps 6 and 7.

In order to expose most perfectly the lymphatic glands at the bifurcation of the external and internal iliac arteries it is necessary to ligate and cut the broad ligament as close to the pelvic brim as possible.

In some cases, especially where the peritoneum clings closely to the pelvic walls, or is more or less fixed by an inflammatory process, it is found necessary, as one of the final steps in the

operation, to split the peritoneum higher up, at the point where the ureter passes over the brim of the pelvis, in order to gain free access to the glands. This modification will be referred to further on.

After cutting the broad ligament away from the brim of the pelvis close to the iliac vessels, the excision should be carried down towards the pelvic floor, great care being observed to dissect out all of the intraligamentary glandular and cellular tissue with it. Especial attention should be paid to the glands at the bifurcation of the iliac vessels, which may not be visible but can be palpated. These glands should be enucleated with the fingers, and the greatest care must be observed in this part of the operation, as one is in the most dangerous proximity to the external iliac artery and vein. Our usual plan is to leave these glands until the last part of the operation, when it will be found more convenient to remove them as shown in Fig. III. When the excision of the broad ligament has been carried down to a point on the pelvic wall corresponding to a transverse line passing through the vesical orifices of the ureters, it is suspended, and the excision of the base of the ligament, which lies in such close relation with the bladder, ureters and rectum, is completed later from below, upward.

After completing the operation on the opposite side in a similar manner (Step 8), the vaginal puncture should be made.

Especial attention is called to the method of excising the portion of the vagina and base of the broad ligaments which are removed with the uterus.

It is exceedingly important to excise a large cuff of vagina; and to accomplish this with the greatest ease and thoroughness, an assistant should insert his finger into the vagina and definitely locate the margins of the cancer, and then withdrawing the finger at least 2 cm. below this point, make strong pressure upward against the anterior vaginal wall. With this assistance the operator is able to dissect down between the bladder and cervix and vagina, and perforate the vagina at the prominence made by the assistant's finger. In this way a wide area outside of the cancer can be excised.

The vagina is opened with pointed scissors, and the anterior wall is ligated in segments, and cut as far out as the ureters on either side (Fig. II). The ligatures must overlap so that a considerable area of tissue may thus be rendered necrotic and thrown off. This makes the extent of the operation wider than that represented by the excised tissue.

From this point on the operation must be continued with the greatest care. The thumb is inserted through the vaginal opening, if the left side is to be excised, and the index finger is carried behind the posterior layers of the broad ligament, acting as a guide to prevent inclusion of the ureter in the ligature and also to indicate the farthest limit for the excision. By constantly pushing the ureter upward against the bladder with the thumb one is able to continue the ligation and excision well out into the broad ligament beyond the vaginal wall and ureters and thus make the most radical operation possible. Fig. II.

The opposite broad ligament is excised from below in the same way when the uterus, broad ligaments and part of the vagina are removed *en masse*.

Before proceeding to Step 10, the pelvic walls in the region of the bifurcation of the iliac vessels are inspected, and if any glands are palpable they should be removed. We have found the following plan of the greatest advantage in this part of the operation. The gland which is usually most prominent is about the size of a large pea or bean and can be palpated distinctly in the crotch of the iliac vessels.

This is worked out from its bed, and when traction is made upon it, the lymph vessel leading upward is made taut and acts as a guide to the next gland. By this procedure we have been able to remove five glands in one chain. It is not possible to go above the pelvic brim, as the last accessible gland lies at this point; the next group of glands being situated higher up on the vena cava and renal vessels.

In operable cases of cancer the metastases rarely go beyond these glands, and frequently, even in very advanced cases, they are not involved.

A further study of the pathology of this subject may show that the removal of these glands will be of value only from the standpoint of prognosis. If the glands are not readily exposed, a grooved director can be inserted beneath the peritoneum along the course of the ureter, when it can be slit open as far as necessary to make the glands accessible and easily removed.

After enucleation of the glands and adjacent cellular tissue the operation is completed according to Steps 10 and 11.

The analogy between cancer of the breast with its glandular involvement and that of the uterus and its involvement of the broad ligament is apparent to all, and the remarkably good results obtained by the radical operation on the breast and axilla have no doubt turned the attention of many operators to the possibility of a more radical operation for cancer of the uterus.

As evidence of this tendency I find, since the publication of my first two cases, that Dr. Reis* of Chicago has worked out experimentally on animals and on cadavers an operation which has for its object the more complete removal of the diseased areas and the pelvic lymph glands.

The operation which Dr. Reis proposed is not described in detail, but I judge from his article that it is similar to the one employed in our ten cases.

Dr. Rumpf† of Berlin reports one case of cancer operated upon, as Reis states, according to his method.

REPORT OF CASES.

CASE 3,‡ Gynecol. No. 3823. R. P., admitted 9, 21, 95, aged 44 years, black.

Chief Complaint. Pains in back and constant bloody vaginal discharge.

Marital History. Married 23 years, ten children, oldest 22 years, youngest 2 years of age, labors natural, easy, usually in bed 2 weeks after labor.

Three miscarriages, no bad sequelæ.

Menstrual History. Flow appeared first in her thirteenth year,

*The Chicago Medical Recorder, November, 1895.

†Centralblatt für Gynecologie, No. 31, 1895.

‡Cases 1 and 2 reported in July-August number of The Johns Hopkins Hospital BULLETIN.

always regular until within last year. Periods are irregular and flow profuse, bright red in color, fluid.

Family History. Good.

Past History. Healthy all her life.

Present Illness. In July, 1894, she ceased to menstruate, but felt very well. About four months later, during sleep, there was an escape of watery fluid amounting to about one gallon. A slight discharge continued, accompanied by a feeling of weakness in her back, but no actual pain. After two months she had a severe hemorrhage, discharging large clots and fatty-looking material. This has continued, but not so profuse, up to the present time. She suffers occasionally from nausea. Abdomen not tender, locomotion slightly painful.

General Condition. Well nourished woman, mucous membranes anæmic, tongue coated, appetite good, bowels regular, micturition at times painful.

Examination. Outlet relaxed. A fungating friable mass about the size of a large orange fills the vault of the vagina. This mass breaks down on the slightest touch and gives rise to free bleeding. The carcinomatous process involves the entire cervix and extends 1 cm. into the vagina. The broad ligaments are apparently not involved.

Diagnosis. Carcinoma of cervix and vagina.

Operation by Dr. Clark, Oct. 3, 1895. Removal of uterus, broad ligaments and part of vagina, with enucleation of pelvic lymph glands.

Catheters inserted into ureters without difficulty. Operation carried out in all of its details. Pelvic lymph glands, apparently enlarged, dissected out above the brim of the pelvis. A cuff of apparently healthy vagina 2 cm. in width removed with uterus.

Note. This case would have been considered a favorable one for vaginal hysterectomy by many operators, as the broad ligaments did not seem to be involved. The dissection of the uterine arteries, however, showed carcinomatous tissue in the broad ligaments. Pelvic lymph glands also appeared to be involved.

Case 4, Gynecol. No. 3888. M. C. D., admitted 10, 17, 95, aged 48 years, white.

Chief Complaint. Bloody vaginal discharge.

Marital History. Married 32 years, eight children, labors not difficult, no apparent sequelæ, youngest child 7 years old. Five miscarriages at various times between the births of her children, none since the birth of last child.

Menstrual History. Began at 12 years, regular, flow free, lasting 4 to 5 days, painless. Became irregular 4 or 5 years ago, flow not appearing for 4 or 5 months at a time. Two years ago it began to appear more frequently and to last longer than earlier in her menstrual life. A year ago the flow became prolonged and copious, lasting two to three weeks, and frequently ending with a free hemorrhage. Since January, 1895, flow has been almost continuous.

Leucorrhœa. When free from bleeding she has a copious offensive yellowish discharge.

Family History. Negative.

Personal History. Hemorrhage from stomach and bowels 15 years ago.

Present Ailment. Constant backache for last year, and for the last few weeks she has had a dull aching sensation in her lower abdomen. History of hemorrhages (*vid. sup.*).

General Condition. Very anæmic, but patient says she does not feel debilitated. She is of very spare habit, but says this is her normal condition. Tongue clear, bowels constipated, appetite good.

Examination. Outlet relaxed, vagina contains fetid bloody discharge. Cervix has been entirely excavated and in its place is a deep punched-out ulcerated pit, which extends upward to the cervico-fundal juncture, outward at least 1½ cm. into the broad ligament, and downward as a ragged area for 2½ cm. into vaginal wall. The ureters seem to be surrounded by the carcinomatous process.

Diagnosis. Cancer of cervix and vagina involving the broad ligaments extensively.

Operation, Oct. 18, 1895, by Dr. Clark. Removal of uterus, broad ligament and 3 cm. of vagina, along with enlarged lymph glands on pelvic walls.

Ureters catheterized before administration of anæsthetic without the slightest obstruction to the entrance of catheters, showing that they were not as extensively involved as at first appeared by the vaginal examination.

Operation much more satisfactory than had been anticipated, as it was found upon opening the abdomen that the carcinoma had involved the broad ligament quite extensively but had not reached the ureters. A very thorough dissection was made, and the carcinomatous tissue in the broad ligaments and vagina was apparently entirely removed. The pelvic lymph glands were not enlarged and appeared normal.

Unfortunately the cancer had extended so far anteriorly and posteriorly that the bladder and rectal walls were probably involved.

At the completion of the operation the patient's pulse was 150, but under the influence of an enema of 1 liter of salt solution and the injection of a similar quantity under the breasts, it quickly dropped to 90 after she was returned to the ward.

10, 24. Vaginal gauze removed, no discharge. Patient has had incontinence of urine since the operation, although she voids almost a normal amount.

General Condition. Steadily improving. Symptoms in every way favorable. Temperature 101°, pulse 110.

11, 10. Patient has made a rapid convalescence. Slight incontinence of urine, but much less than when previously noted.

11, 26. Patient discharged. Still has slight incontinence of urine. General condition excellent.

Vaginal wound perfectly healed. No apparent disease visible.

Bladder carefully examined and ureters catheterized to prove definitely that the incontinence did not come from a ureteral fistula. Both ureters found to be normal.

Incontinence probably due to a slight paralysis of the *sphincter urethræ*.

Feb. 24, 1896. Patient's husband reports to-day that his wife is apparently well, has gained in flesh and strength, and is able to do all of her house work. Incontinence quickly passed away after she returned home.

Note.—This case represents the extreme limit of the operation for the radical removal of cancer of the uterus. Prognosis as to cure unfavorable, but as to relief of symptoms and prolongation of life good.

Case 5, Gynecol. No. 3923. E. J. C., admitted 10, 30, 95, aged 53 years, white.

Chief Complaint. Bloody vaginal discharge.

Marital History. Married twice, the first time 30 years ago, the second time 17 years ago. One child, 23 years of age, labor easy, no bad sequelæ. One miscarriage in the second month 25 years ago.

Menstrual History. Began at 16 years, regular, flow free, lasting 4 to 5 days, without pain. Climacteric one year ago.

Leucorrhœa. For the last few months she has had a thick, yellowish, irritating and offensive discharge.

Family History. One sister dead of phthisis, grandfather had a cancer, otherwise history negative.

Personal History. Healthy as an adult, except an attack of rheumatism four years ago.

Present Ailment. For the last four or five months has had a yellowish discharge, which has lately become blood-tinged. The latter has steadily increased, never amounting to a hemorrhage, but only a slight oozing, more marked after exertion. She has had no pain. Defecation at times painful.

General Condition. Patient has lost flesh and strength in the last six months. Appetite fair, bowels regular.

Examination. Outlet normal (parous). Cervix excavated by ulcerative process, the normal outlines of the cervix being entirely obliterated, and in its place there is a deep pit which extends up to the cervico-fundal juncture, and out into vaginal walls. Bladder and rectum apparently not involved. Broad ligament slightly fixed and indurated.

Diagnosis. Cancer of cervix and vagina, extending out into broad ligaments.

Oct. 31, 1895. Preliminary curettement without ether, all redundant tissue removed and vagina cleansed.

Nov. 2. Operation by Dr. Kelly. Removal of uterus, broad ligaments and part of vagina, also lymph glands at brim of pelvis.

Bougies inserted before operation. Details of operation carried out in full.

Patient lost no blood during operation, and was returned to ward with a pulse of 112. Saline injection under breasts and salt solution enema of one liter given. Incision closed with buried silver wire and subcutaneous catgut sutures.

Nov. 10. Vaginal gauze removed. Patient has had no nausea or vomiting following operation.

Nov. 11. The incision broke down and discharged a large amount of pus. General condition of patient very good.

Nov. 24. Incision perfectly healed without removal of silver sutures.

Dec. 3. Patient discharged to-day. Examination in the knee breast posture shows the vaginal vault almost completely healed. A small point of cleavage is still present, which is covered with granulation tissue. Imbricated sutures are seen well outside of the limit of granulation tissue.

So far as now demonstrable the result is satisfactory. Patient has made an ideal recovery, with the exception of the suppuration of abdominal wound.

CASE 6, Gyn. No. 3980. M. K., admitted 11, 4, 95, aged 44, white.

Chief Complaint. Constant vaginal discharge of yellowish or bloody matter.

Marital History. Married 29 years, five children, labors normal, three miscarriages, no bad sequelæ.

Menstrual History. Menstruation began at fifteen years, regular, not painful, duration usually four days, but for last two years a day has occasionally intervened during the menstrual flow when the discharge has ceased.

During the past year the flow has occurred at times every two weeks. Two months ago the flow was very copious, amounting as the patient thinks to a hemorrhage. Last period one month ago, of short duration and very scanty. Since last period constant hemorrhagic discharge. Menstruation previous to last two years has been copious, at times discharged in large clots.

Family History. Negative.

Personal History. Measles when a child. Has never been strong.

Present Condition. In June, 1895, patient first noticed that menstrual flow became more or less constant. It has continued without cessation up to the present time, and has increased rapidly in the last three weeks. Discharge is brownish, very fluid, offensive and irritating.

General Condition. Has lost about 20 pounds in past year. Appetite good, marked anæmia, patient feels weak and languid, bowels constipated, micturition painless.

Examination. Outlet greatly relaxed. Filling fornix of vagina and projecting half-way down into the vagina is a fungous mass about the size of a fœtal head. The mass bleeds on the slightest touch, is very friable, and the odor from the discharge is very offensive. The carcinomatous process has destroyed the cervical portion of the uterus, but the vaginal walls seem to be but slightly involved. Vesical and rectal walls not encroached upon. The broad ligaments are apparently involved as far out as the ureters.

Fundus uteri normal in size, freely movable and not adherent. Appendages normal.

Diagnosis. Cancer of cervix extending into broad ligaments.

Operation, Nov. 7, 1895, by Dr. Clark. Removal of uterus with broad ligaments and part of vagina.

Ureteral catheters introduced before ether was administered. The right ureter was catheterized with great difficulty on account of an apparent constriction of its lumen, and during the cleansing of the vagina the catheter slipped out into the bladder, but with the aid of the catheter on the opposite side the operation was completed without great difficulty.

Preliminary curettement of cervical mass attended with much hemorrhage, requiring a tight pack to control it while the abdomen was being opened and the uterine arteries ligated.

Uterine artery senile, requiring a ligature around its branches close to the uterus to make it stand out prominently.

On the right side the carcinomatous process had extended out farther than on the left.

Lymphatic glands in broad ligament not enlarged, and apparently not the seat of metastasis.

Pulse at completion of operation 108, no blood lost during the hysterectomy.

On account of great anæmia and liability to shock, 1 liter of normal salt solution was injected beneath the mammary glands, and 1 liter of salt solution given by enema.

Abdomen closed with buried silver wire and subcutaneous catgut sutures.

Nov. 8. Patient has complained of no thirst, pulse 60, full and strong, rapid recovery from ether.

Nov. 13. Vaginal gauze removed without difficulty.

Nov. 16. Abdominal incision perfectly healed. General condition excellent.

Dec. 5. Patient discharged. Vaginal vault healed with the exception of one small area which looks suspicious.

Note.—On account of the wide extension of the disease on the right side this case is considered unfavorable for permanent cure.

CASE 7, Gynecol. No. 4031. A. A. L., admitted 12, 19, 95, aged 41 years, white.

Complaint. Backache and a constant irritating watery discharge.

Marital History. Married at 17 years of age, two children, oldest 21 years, youngest 19 years. Labors normal. One miscarriage 18 years ago.

Menstrual History. Menstruated first at 13 years of age. Always regular until two years ago. Since that time irregular (see *Present Illness*).

Leucorrhœa. Has had a slight discharge for several years; for last six months this has assumed a watery consistency and is slightly tinged with blood.

Family History. Good.

Past History. Always strong and healthy until present illness began.

Present Illness. Began with a hemorrhage about one and one half years ago while nursing a sick member of the family. This occurred at a regular period, and she gave but little thought to it. The next menstrual epoch was ushered in the same way, the flow continuing more or less profuse for five weeks. Flow then appeared regularly until September, 1895, when she again had a profuse hemorrhage, which recurred November 4th and 26th. Since the last date she has had irregular hemorrhages, with a watery, acrid discharge in the intervals.

General Condition. Patient has not lost an appreciable amount of flesh, but has grown weaker and paler. Bowels constipated, urination normal, appetite poor. Fairly well nourished, mucous membranes pale and anæmic.

Examination. Outlet relaxed. In the vaginal vault there is an ulcerated area 5x7 cm., its longest diameter transverse. The cervix uteri seems only slightly if at all involved. The disease reaches

within 1½ cm. of the os uteri, which is slightly lacerated but not infiltrated. A small mucous polyp hangs from the cervix. The infected area has a typical carcinomatous appearance, the central portion is necrotic, white, and exhales a fetid odor. The margins are raised and are of a pinkish color, and there is a sharp line of demarcation between it and the surrounding mucous membrane. The entire upper third of the vagina and the upper part of the middle third are involved, and the disease extends over into the right lateral wall. Rectal examination shows no extension of the disease in that direction. Uterus and appendages normal.

Diagnosis. Carcinoma of vagina extending up into right vaginal fornix, and involving broad ligament.

Operation, Dec. 23, 1895, by Dr. Kelly. Removal of uterus, broad ligaments, infected portion of vagina, and accessible pelvic lymph glands.

Black rubber bougie inserted into ureters before the administration of ether.

In this case the usual steps of the operation were departed from, in that the carcinomatous area in the vagina was first outlined by an incision, and partly dissected up to the vaginal fornix, after which the abdominal incision was made and the operation completed in its usual way. It was attended by more bleeding than usual on account of the extreme vascularity of the vaginal walls.

The lymph glands on the right side were enlarged and distinctly palpable. A chain of five glands was dissected off from the bifurcation of the external and internal iliac vessels.

At the completion of the operation, while the ureter on the left side was being pushed to one side, the bougie suddenly broke close to the bladder with an audible snap. Dr. Kelly attempted to push the broken end down into the bladder and catch it with forceps introduced through the urethra, but this proved impossible. He then pushed it back to its former location, and splitting the ureter open longitudinally, withdrew it. The incision was neatly closed with one fine silk mattress suture, without occluding the ureter or diminishing its caliber. Since this accident, hard rubber bougies have been discarded and the English catheter substituted.

At the completion of the operation the patient's pulse was 140 and weak but it improved at once under the effects of the submammary injections and rectal enema of normal salt solution. Her pulse when she returned to the ward was 128. Incision closed with silver wire and subcutaneous catgut.

Dec. 24. Patient has had considerable pain and nausea. The question of occlusion of the ureter is certainly eliminated by the fact that she has passed twelve hundred cubic centimeters, or a normal amount of urine within the last 24 hours.

Dec. 29. Patient has been exceedingly nervous and complains of great pain. Temperature 100° F., pulse 90. No tenderness or tympanitis. Bowels have moved very satisfactorily. Vaginal gauze removed, slightly blood-stained.

Dec. 30. Abdominal incision separated on account of the breaking of one of the silver wires. Cocaine was at once applied and the edges of the wound were brought together with penetrating silkworm-gut sutures.

Jan. 27th, 1896. Patient has made a steady recovery since the last note and is discharged to-day. The vaginal wound is not entirely healed, but appears perfectly healthy.

Case 8, Gynecol. No. 4056. G. H., admitted 1, 4, 96, aged 34 years, white.

Complaint. Bloody vaginal discharge.

Marital History. Married 14 years, five children, all labors easy except fifth, which was very tedious. Last labor 3 years ago. Three miscarriages—first in the seventh month, second in the sixth month, and third in the fifth (twin pregnancy), occurring in June, 1895, 1 fœtus macerated, the other living at birth.

Menstrual History. Menses began at 13 years, regular, painless, flow moderate, never clotted previous to July, 1895. Since then the discharge is always clotted and offensive.

Leucorrhœa. None.

Family History. Negative.

Personal History. Always healthy up to July, 1895.

Present Ailment. In July, 1895, one month from the time of her last miscarriage, she began to have a discharge of clotted blood, which increased in frequency and amount until three months ago, when her physician excised part of the cervix. She was temporarily relieved, but flow again appeared and continued up to seven weeks ago, when the cervix was curetted, followed again by slight checking of the discharge.

The discharge is now thick, pinkish and offensive.

General Condition. Has lost considerable flesh. Is of spare habit, anæmic, anxious expression, appetite good, bowels regular, micturition painless.

Examination, Jan. 8, 1896. Outlet moderately relaxed. Projecting from anterior and posterior lip of cervix is a fungating mass, about the size of an egg, which bleeds on touch.

It is almost entirely limited to the cervix, and only projects slightly into anterior and posterior vaginal walls. Fundus uteri slightly enlarged, movable, appendages normal. Broad ligaments do not seem to be involved.

Diagnosis. Cancer of cervix.

Operation, Jan. 8, by Dr. Clark. Removal of uterus, broad ligaments and a wide cuff of vagina, and pelvic lymph glands.

Bougies inserted under the influence of cocaine without difficulty before etherization.

This operation was uncomplicated, and so far as macroscopic appearances of the removed specimen, all of the disease was removed.

Submammary injections of salt solution and rectal enema of 1 liter of salt solution given. Pulse at completion of operation 140 and very weak. In two hours it had dropped to 90 and was full and strong.

Jan. 10. Patient reacted well from operation.

Jan. 16. Vaginal pack removed without difficulty. Patient has been a victim of the morphia habit before she entered the hospital, and suffered greatly from the withdrawal of the drug after operation.

Feb. 8. Patient has made an uneventful recovery. She has increased in weight; her expression is now good, color of skin and mucous membranes greatly improved. General condition excellent.

Examination shows the vaginal vault to be completely healed and there are no apparent remains of the cancer left.

Case 9, Gynecol. No. 4070. E. P., admitted Jan. 11, 1896, aged 43 years, white.

Complaint. Pain in the lower right abdomen and across kidneys. Almost constant bloody vaginal discharge.

Marital History. Married 26 years. No children and no miscarriages.

Menstrual History. Began at 13 years, always regular, periods occurring every fourth week, not painful, amount moderate, lasting one to two days, bright red, not clotted. Last period Jan. 1, 1896.

Leucorrhœa. For last 10 years, profuse yellowish-green, non-offensive, irritating discharge.

Family History. Negative.

Personal History. No illness since maturity up to the beginning of this ailment.

Present Condition. First noticed pain in left lower abdomen two years ago, occurring suddenly as a sharp cutting pain, which has gradually grown worse, and has often confined her to bed for three days to one week at a time. During attacks pain may be "sharp or dull thudding," does not radiate.

Patient lies on left side with left thigh flexed upon the abdomen. Nausea and vomiting are at times present, though not confined to attacks. Tenderness is more marked during attacks.

When walking she limps and inclines the body forward. Pain

FIG. I.—Method of dissecting uterine artery out to its origin. Ureter is seen passing immediately beneath uterine artery.

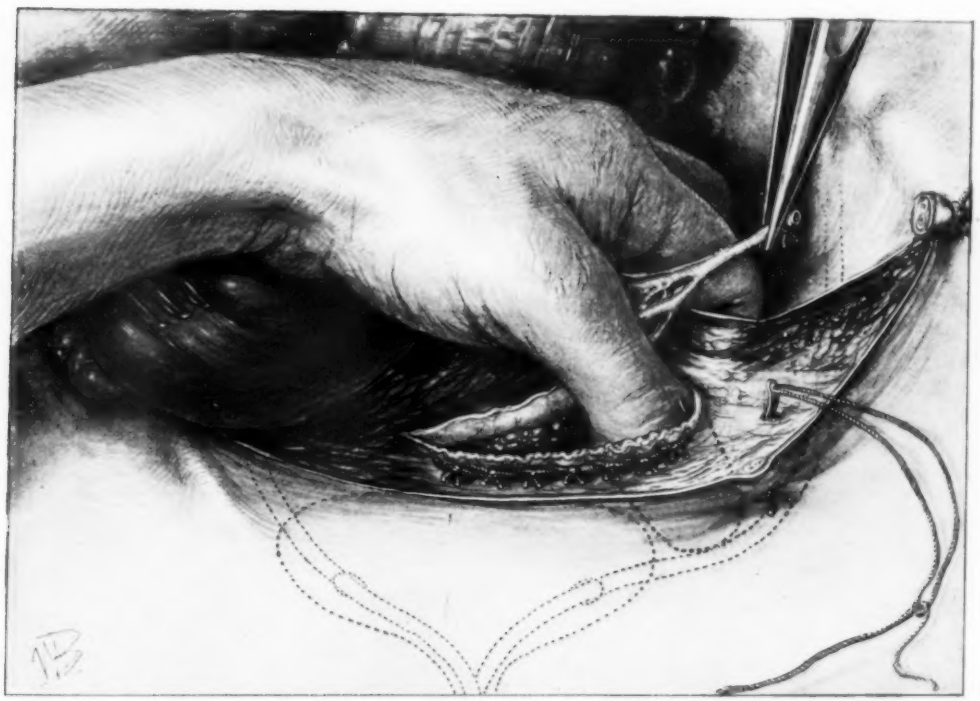


FIG. II.—Uterine artery doubly ligated and cut. Fore-finger posterior to broad ligament, thumb inserted through vaginal incision pushing ureter towards pelvic wall, thus permitting a wide excision of the broad ligament.

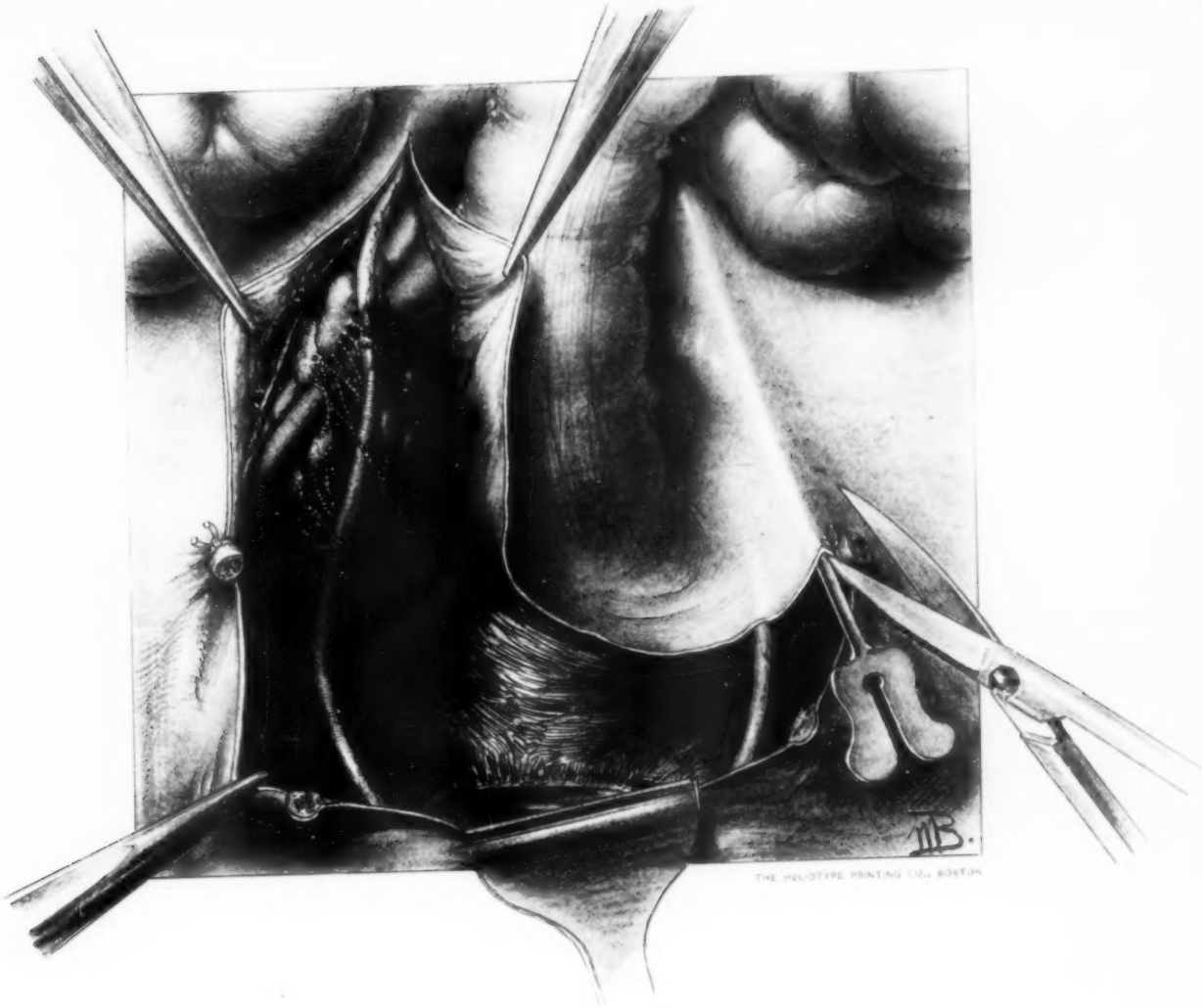


Fig. III.

RADICAL OPERATION FOR CANCER OF THE UTERUS.

ON THE LEFT SIDE THE METHOD OF SPLITTING THE PERITONEUM IS DEMONSTRATED, WHILE ON THE RIGHT THE PERITONEUM IS LAID OPEN, EXPOSING PELVIC LYMPH GLANDS AT THE BIFURCATION OF THE INTERNAL AND EXTERNAL ILIAC VESSELS; ALL THESE GROUPS OF LYMPH GLANDS ARE SELDOM ENLARGED IN ONE CASE. BOUGIES HAVE BEEN INSERTED IN THE URETERS, WHICH STAND OUT PROMINENTLY. STUMPS OF ~~LITIGATED~~ LIGATED UTERINE ARTERIES ARE SEEN EXTERNAL TO THE URETERS.

"across the kidneys" began two years ago, and has gradually increased until the present time, when it is a constant ache, which at times is increased to sharp, cutting pain. During these exacerbations of pain the vesical distress is increased, causing frequent voiding of small amounts of urine, which is accompanied and followed by pain and burning.

For past year micturition has been increased in frequency. Retention of urine is painful.

Bloody vaginal discharge began two years ago, at first at variable intervals, but for past year is constant. At first bright red, it varies at present between pink and dark red.

Two months ago she had a larger hemorrhage than usual, discharging a pint of clotted blood.

General Condition. Has lost flesh, fairly well nourished, color not good as formerly. Patient looks much older than the age given (43 years). Appetite good. Bowels constipated. Urine contains a moderate number of pus and epithelial cells.

Examination. Outlet intact, cervix excavated with jagged ulceration, leaving a shell-like margin. This ulcerative process is confined to cervix and has not invaded the vaginal walls.

The broad ligaments appear to be free. Fundus in retro-position freely movable.

Considerable pain on pressure in left ovarian region. Appendages normal.

Diagnosis. Cancer of cervix.

Operation, Jan. 15, by Dr. Kelly. Removal of uterus, broad ligaments, part of vagina and pelvic lymph glands.

Ureters catheterized before administration of ether. Details of operation carried out as usual. A very thorough dissection of intraligamentary and pelvic cellular tissue with the lymphatic glands and vessels. Cancer was found to run out closely to the ureters, and appeared to involve the bladder at these points. The muscular coat of bladder was slightly lacerated, bnt not more so than in former operations. At the completion of the operation the patient was in a very good condition, considering the extensive operation to which she had been subjected.

The usual submammary injection of 1000 cc. of salt solution and a rectal enema of 1000 cc. of salt solution were given.

Incision closed with buried silver wire and catgut.

Jan. 19. Patient has reacted well from the operation. Pack removed and found covered with a slight bloody discharge.

Jan. 22. For the last few days patient has complained of incontinence of urine, with burning pain on micturition. Temperature 99° F. and pulse 90. Patient weak and drowsy.

Jan. 27. Line of incision perfectly healed. Condition otherwise almost same as noted above. Vesical irrigations bring away considerable amount of pus and flaky matter.

Feb. 1. Incontinence continues the same, vulvæ excoriated and red. External genitals bathed with boric acid solution and covered with zinc oxide ointment. Patient's general condition worse.

Feb. 7. Patient very weak and drowsy, expression listless, complete incontinence of urine.

Feb. 10. Patient is now suffering intense pain in bladder and rectum. Condition growing worse rapidly.

Feb. 12. Patient died suddenly this morning.

Autopsy, Feb. 13, by Dr. Flexner.

Anatomical Diagnosis. Operation wound for extirpation of uterus and broad ligament; sloughing cystitis and pericystitic infiltration (purulent). Rupture into rectum. Purulent proctitis. Ascending pyelo-nephritis.

Surface. Body 146 cm. long, slightly built, greatly emaciated, abdomen scaphoid, no subcutaneous œdema.

Mucous membranes of conjunctiva pale.

In midline of body from umbilicus to symphysis, linear scar 14 cm. long, completely healed.

Omentum. The omentum is adherent to under surface of incision by delicate fibrous adhesions; with this exception, the omentum is free; it contains a small amount of fat.

Peritoneum. Peritoneal cavity does not contain any excess of fluid. Intestines free from adhesions, serosa delicate, perhaps a little granular, especially on the jejunum.

Mesenteric glands not enlarged, but through mesentery appear congested. Delicate adhesions between one of the lower loops of the ileum and the stump of the ovarian vessels on the right side.

Appendix. Normal.

Sigmoid flexure. The sigmoid flexure projects to the right side and is bound by very light adhesions to the peritoneum over the iliac muscles, by firmer adhesions to the bladder. On breaking these adhesions to the bladder this is noticed to be much discolored, of a greenish and in places almost black hue, which extends to the peritoneum covering the sigmoid flexure.

The seat of operation is apparently in perfect condition, the peritoneum is firmly united, and the catgut suture joining the vesical and rectal reflections of the peritoneum is not yet absorbed.

Heart. Normal.

Lungs. Normal.

Spleen. Small, but appears normal.

Left kidney. Free from adhesions. Is not markedly dilated. Capsule is adherent; in some places corresponding to the adherent areas the surface is granular.

The cortex generally has a slight pinkish tint in which there are many white elevated nodules, varying in size from a miliary tubercle to lines and dots of sand. On section these agree with linear lines of varying width extending upwards from pelvis.

Pelvis dilated, mucous membrane thickened and congested and shows numerous ecchymoses.

Pelvis contains greenish thick pus.

Ureter dilated to size of a large quill, mucous membrane much congested, thickened and contains small ecchymoses.

Right kidney. Somewhat larger than left, capsule firmly adherent. Pelvis not dilated, but mucous membrane thickened, ecchymotic and very hyperæmic. Kidney a mass of small and confluent abscesses; on section of these, pus escapes only occasionally. It seems to be a diffuse interstitial infiltration rather than localized abscess-formation.

Bladder. Bladder is fixed to pelvic wall and cannot be removed without more or less tearing of its substance. On both lateral walls the soft tissues are necrotic, pigmented, and gangrenous in appearance, as deep as the bony structures. A considerable amount of semi-fluid pus escapes on exerting the slightest pressure on the tissues about the bladder on either side; there is more, however, on the left than right. The bladder itself has thickened walls; its mucous membrane is a pultaceous pigmented purulent mass. There are some mineral concretions in the dark pus which covers the surface.

Left ureter is evidently occluded at its point of entrance into the bladder, but is certainly not included in a ligature.

Intestines. The jejunum is pale and moderately distended. The ileum is contracted. The large intestine is normal. Mucous membrane of the rectum covered with pus, and in its middle third there is an opening communicating with pericystic abscess and bladder.

Pancreas. Pale and firm.

Stomach. The mucous membrane is pale.

Duodenum. A few small congested patches.

Œsophagus. Normal.

Liver. Small, free from adhesions. On section somewhat mottled. Central veins very distinct. Weight 960 grams.

Gall bladder. Moderately distended with thick dark bile.

Glands. All of the glands in the abdominal cavity, so far as they could be found, were dissected out and examined macroscopically.

The retroperitoneal, above the pelvic brim as well as those in the abdominal cavity, especially the glands lying upon the external iliac vessels and between these vessels and the psoas muscle, were removed. In no case were they found to contain metastases, nor were they perceptibly enlarged.

The absence of metastasis refers to the examination by the

unaided eye. It will be necessary to make sections to exclude metastasis with certainty.

Microscopic Examination. Lymph glands normal.

Case 10, Gynecol. No. 4143. M. E., admitted 2, 11, 96, aged 33 years, white.

Chief Complaint. Bloody vaginal discharge.

Marital History. Married 17 years, seven children, labors usually long and tedious, especially the first and sixth, non-instrumental. Twin births at one labor.

Attended in confinements by a midwife. Laceration of perineum during first labor. Last labor 3 years ago. One miscarriage in December 1895, no ill effects.

Menstrual History. Flow began at 14 years, regular every fourth week up to 3 years ago. For past three years periods have been exceedingly irregular, varying from one to two months apart. During last six months she is unable to differentiate the menstrual flow from an almost constant hemorrhage which she has had.

Leucorrhœa. During the last six months she has had a profuse, yellowish, non-irritating, offensive discharge, when the bloody discharge was not present.

Family History. Negative.

Personal History. Since maturity no definite illness, but patient has never felt perfectly well.

Present Condition. First noticed bloody vaginal discharge about six months ago, at which time it was very scanty, but has continued almost constantly since that time. At times the flow is very profuse, coming in gushes which vary in amount from ½ to 1 pint.

General Condition. Has lost some flesh, but is still a very stout woman, weighing about 190 pounds. She is very anæmic, appetite good, bowels constipated, micturition normal.

Examination. Outlet considerably relaxed, cervix occupied by a fungating mass which is about the size of a base-ball, and projects half-way down into vagina. This mass springs from the posterior lip of the cervix and has apparently not spread beyond this point. The tissue is very friable and breaks down under the lightest touch. Uterus movable, not adherent. Appendages normal. Broad ligaments do not seem to be involved. The abdominal walls are very thick, and hang pendulous in a large fold.

Diagnosis. Cancer of cervix.

Operation, 2, 13, 96, by Dr. Clark. Removal of uterus, broad ligaments, a cuff 3 cm. in width of vagina, and the pelvic lymph glands.

Catheters inserted into ureters without difficulty before etherization. In this case the operation would have been impossible without the catheters in the ureters, as the abdominal walls were thick, 8 cm. (3 in.), and the pelvis was very deep, which rendered the operation exceedingly difficult.

The entire web-like structure of lymphatics with numerous glands were removed from the lateral pelvic walls, and the vagina was widely excised around the margin of the cancer. The operation required three hours to complete it. The patient's pulse was 146 when she left the table, but under the influence of the salt enemata and injection beneath the breasts, quickly dropped to 110, and the patient recovered rapidly from the anæsthesia without the slightest sign of shock.

SUB-ACUTE AND CHRONIC CYSTITIS TREATED BY THE VESICAL BALLOON.*

By J. G. Clark, M. D., *Resident Gynecologist, the Johns Hopkins Hospital.*

The most frequent cause of cystitis is catheterization of the bladder without proper observance of aseptic details, in post-operative and obstetrical cases.

The highly concentrated urine excreted for the first few days after surgical operations, especially after the more serious abdominal sections, gives rise to needless irritability of the bladder and renders frequent catheterization necessary.

A series of observations made by Dr. Russell on the urinary excretion for the first five days subsequent to cœliotomy shows a great diminution in the normal amount of fluids with an increase in the solids of the urine. If, in addition to this chemical irritant, infectious matter is introduced into the bladder by the catheter, the most favorable conditions are present for the production of a serious inflammation. The rigid technique in catheterization insisted upon by modern surgeons fortunately renders this complication comparatively rare, and the chronic forms of cystitis as a rule date the onset of the attack to a specific infection or a badly conducted puerperium.

The acute forms of cystitis usually yield to treatment, if taken in hand at once, by mild vesical irrigations and diuretics, as it is only necessary to eliminate the cause of irritation, which is readily reached by these means, to cause a subsidence in the inflammation.

The method of treatment which I am about to describe is not advised in these simple acute cases; but in the sub-acute or chronic cases it finds its field of usefulness. The unsatisfactory results of treatment of these obstinate ailments by the usual therapeutic remedies are universally acknowledged by all physicians and surgeons.

The late Professor Goodell, of the University of Pennsylvania, in his remarks preceding the details of treatment of chronic cystitis, usually spoke of the extreme persistence of the inflammation and the difficulty of curing it, a statement fully confirmed by the large number of remedies which he afterwards suggested for its treatment.

The one symptom common to all forms of cystitis is frequent and painful micturition, due to the expulsive efforts of an inflamed bladder, excited either by a slight distension of the bladder or by the presence of irritant salts in the urine.

If the acute inflammation is not soon relieved the bladder remains contracted, the mucous membrane becomes congested and thickened, new connective tissue is formed in the vesical walls, the rugæ are much more prominent than normal, and the intervening sulci conceal septic matter which cannot be reached by irrigation, as the moment the fluid begins to distend the bladder such acute pain is produced that the bladder contracts with great force and prevents it even coming in contact with the deeper parts, much less washing away or rendering innocuous the concealed pus. As evidence of this, one can see almost immediately after the most thorough vesical irrigation with a two-way catheter, small quantities of urine voided, highly charged with pus, desquamated epithelium and other degeneration products.

* Read before the Johns Hopkins Hospital Medical Society.

It is to overcome this difficulty in reaching the source of infection that the vesical balloon is especially valuable.

At one of Dr. Kelly's clinics given during the meeting of the American Medical Association, in May, 1895, I exhibited an improvised apparatus, made by attaching a toy balloon to an English catheter, and demonstrated its method of application. Since then special balloons have been made which have proved in every way satisfactory.

By means of this apparatus the bladder is distended, the rugæ smoothed out and all of the inflamed and infected areas are brought in contact with the vesical balloon, which is employed as the carrier of therapeutic remedies.

Rubber balloons have been introduced into the bladder and inflated preceding the repair of vesical fistulæ, to facilitate the operation, but so far as I am able to glean from medical literature, this is the first employment of such an apparatus for the treatment of cystitis.

The Vesical Balloon.

The apparatus consists of a small balloon made of thin rubber, 6 cm. in diameter when collapsed, connected with a thicker rubber tube 26 cm. in length, with a small cut-off valve or clip to retain the air when the bag is inflated. These balloons can be distended to about the size of a well-filled normal bladder.

We have employed the usual surgical aspirator as the most convenient means for inflating the balloon, but the small rubber bulbs connected with nasal atomizers, or a cheap air-pump like the bicycle-pump, would probably be equally satisfactory.

The balloons are made of delicate rubber tissue, and if not carefully preserved are soon destroyed. They should be washed in warm water immediately after use, and then slightly inflated and allowed to dry thoroughly, in order to prevent the walls of the collapsed balloon from adhering together.

When the apparatus was in its experimental stage we used the oleaginous ointments, which were quickly found to decompose the rubber, and at the suggestion of Mr. Waltz, pharmacist to the Johns Hopkins Hospital, gelatine was tried, which at once proved an ideal vehicle for the various medicaments.

Gelatine possesses the advantages of melting at the body temperature and not injuring the rubber, and when brought in contact with the mucous membrane of the bladder is quickly absorbed.

Up to the present time we have found a ten per cent. ichthyol gelatine very satisfactory. In addition to this we have had made up a bismuth, zinc, salicylic acid and bichloride gelatine, but so far have had no occasion to use them.

Method of Applying the Vesical Balloon.

Before using the balloon it should be boiled and placed in a boric acid solution or in sterilized water. The capacity of the balloon should always be accurately determined previous to its use, by inflating it to the size desired, and counting the number of cylinders or bulbs of air required to fill it.

By observing this precaution there is no danger of overdistending the bladder, as the exact degree of distension is determined by the number of cylinders of air introduced.

The external urethral orifice and surrounding parts are cleansed with soap and water and bichloride solution (1 to 1000) by the nurse, after which the bladder is catheterized and the patient placed in the knee-breast posture, carefully protected by a sheet.

The patient should lie with chest flat on the table, her arms hanging over the sides, in order to make the bladder distend perfectly when the speculum is introduced.

A small pledget of cotton rolled on an applicator is saturated with a twenty-per cent. solution of cocaine and inserted into the urethra and allowed to remain for 3 minutes, when a No. 10 vesical speculum can be introduced without giving the patient much pain. Frequently the patient complains of no discomfort whatever until the end of the speculum impinges upon the inflamed mucous membrane of the bladder wall.

Before the patient is placed in position, the gelatine, which has been previously sterilized, is immersed in a water bath and melted. For ordinary use in private practice or in a limited hospital service it is not necessary to have the elaborate apparatus here figured (Fig. III), but a small metallic ointment box is sufficient for all practical purposes.

The temperature of the water bath should be only sufficient to reduce the gelatine to the consistency of cold olive oil, as in this state it will adhere better to the balloon, which can be more easily rolled into the form of a suppository.

Before preparing the balloon for introduction into the bladder the hands should be disinfected. The bag is rolled between the thumb and forefingers in the same way as a hand-made cigarette. Into the concavity which naturally forms when the balloon is completely collapsed the gelatine is poured to overflowing, and the balloon slowly rolled, more gelatine being added until it assumes the form of a suppository well covered with the semi-fluid gelatine. It is now clasped with a long, slender crane's bill forceps, Fig. II, and inserted through the speculum into the bladder and released.

As the distension progresses the patient suffers considerable pain and an urgent desire to void her urine. By forewarning her of these attendant symptoms she will be able to withstand the pain, and the inflation can be carried up to the desired degree in 3 to 5 minutes.

The pain in chronic cystitis is usually severe during the first two or three applications, but the patient as a rule experiences so much relief subsequently that she is willing to persevere in the treatment.

A rectal suppository of 1 grain of opium, introduced immediately after the treatment, is of great service in alleviating the subsequent suffering. Having inflated the bag up to the required size, the clip on the rubber tube is closed, and the patient then assumes the dorsal or lateral posture.

Our rule is to leave the balloon in place for 15 or 20 minutes, beyond which time it does not appear safe, as the ureters are blocked while it is in place. In removing the balloon the clip is opened, when all but a small amount of air escapes; the rest is then aspirated with the air-pump, when the collapsed rubber bag is easily pulled out through the urethra.

We have treated at least ten cases with success by this apparatus. A history of one case, of a severe type of chronic

cystitis of 13 months standing, well represents the efficiency of the vesical balloon.

CASE OF CHRONIC CYSTITIS.

M. J., admitted 10, 21, 95, colored, aged 35 years, married 10 years, no children, no miscarriage.

Complaint.—Frequent and painful micturition. Hematuria.

Menstrual History.—Menses appeared first at 16 years, always irregular, sometimes not occurring for two months. When she was about 27 years old she had a continuous fever for about one year, after this she only had a slight discharge every three months.

For the last 7 or 8 years the menstrual flow has ceased and there is no history of vicarious menstruation. She has suffered no inconvenience on this account, and says she is perfectly well with the exception of her present complaint.

Family History.—Mother living and well, two sisters died of phthisis.

Personal History.—Patient has always been "delicate," but has never had any prolonged spell of illness.

Present Ailment.—About thirteen months ago she began to have slight pain on urination, which grew rapidly worse, notwithstanding the remedies given by her physician. For the last five months blood has frequently appeared in the urine.

The frequency of urination is much greater at night, when she is often compelled to get up 8 to 10 times. She does not think the pain is increased by exertion, but says one week ago when coming to the hospital she had agonizing pain and several blood clots were passed.

There is a constant dull pain over the bladder, which becomes sharp and cutting during micturition. About the time the patient began to experience painful urination she noticed a yellowish vaginal discharge, which was probably of gonorrheal origin.

Present Condition.—Patient says she has lost considerable flesh since illness began. Defecation painful when bowels are constipated. Frequent and painful urination. When the paroxysms come on the patient has an expression of intense pain.

Examination of Bladder.—Urethra congested and reddened. The vesical trigone is intensely reddened, the rugæ stand out prominently, and over the surface of the bladder are flakes of pus and small blood clots. The area of intensest inflammation is in the inter-ureteric area and gradually shades off towards the fundus of the bladder.

In the areas of greatest inflammation the mucous membrane is of an angry red color and bleeds when touched lightly with the ureteral searcher. The capillaries are indistinguishable in the inflamed areas, and a careful search of the bladder fails to reveal the ureteral orifices. In the less congested areas above the trigone the capillaries are prominent, and at various points small, intensely red clumps or congeries of minute vessels are seen.

The anterior wall of the bladder in isolated places appears normal.

Treatment.—Application of ten per cent. ichthyol gelatine by means of vesical balloon. Patient experienced great pain at the time of application.

10, 22. Patient greatly relieved two hours after treatment, and still feels much better than before the treatment.

10, 23. Balloon again applied, still very painful; bladder appears less congested and the ureteral orifices are faintly visible. Marked improvement in symptoms; urination much less painful. Patient got up only three times last night. A colored drawing of the bladder by Mr. Brödel as it now appears is shown in Fig. IV.

11, 10. The bladder has been treated every third day since the last note was made, and now appears almost entirely well. The patient no longer experiences any pain between the treatments and thinks she is entirely well. Advised to remain one week longer.

11, 19. Patient discharged to-day. The mucous membrane has assumed a perfectly healthy hue, except a slightly increased reddening around the ureteral orifices. No treatment since the last note. The pain is entirely relieved, and the patient got up but once last night to urinate. A second colored drawing made by Mr. Brödel, Fig. IV, shows the present condition of the bladder.

THE STERILIZATION OF CATGUT BY CUMOL.*

BY J. G. CLARK, M. D., *Resident Gynecologist*, AND G. B. MILLER, M. D., *Assistant Resident Gynecologist*, *The Johns Hopkins Hospital.*

Since the introduction of catgut as a practical suture and ligature material by Lister, many articles have been written for and against its use, and numerous methods of sterilization have been proposed. That many of these methods are unreliable is shown by the outbreaks of infection which have been traced either by direct bacteriological investigation or by the strongest circumstantial evidence to the catgut used in the cases.

Koch first called attention to the fact that commercial catgut as it is usually received from the manufacturer is rarely infected with pyogenic organisms, which accounts in a great measure for the absence of infection following the use of catgut prepared by the most questionable methods.

This observation has been largely lost sight of in the discussion of this subject, and many surgeons claim to obtain the most satisfactory results from the employment of catgut which is open to the gravest objections when considered from the bacteriological standard. At least three serious outbreaks of infection in surgical cases have been attributed to catgut. The first occurred in 1879 in the service of Zweifel, which was certainly traced by Koch to the suture material by a careful bacteriological study.

The urgent protest of Zweifel against the use of the Lister method of sterilization by carbolized oil caused many surgeons to abandon catgut.

Kocher, in 1881, after a very superficial study of the

* Read before the Johns Hopkins Hospital Medical Society.

FIG. I.

Vesical bag covered with gelatine and partially rolled.

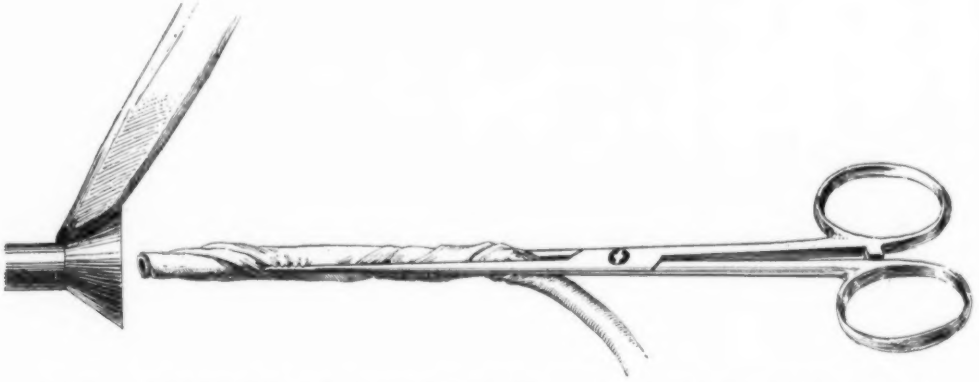
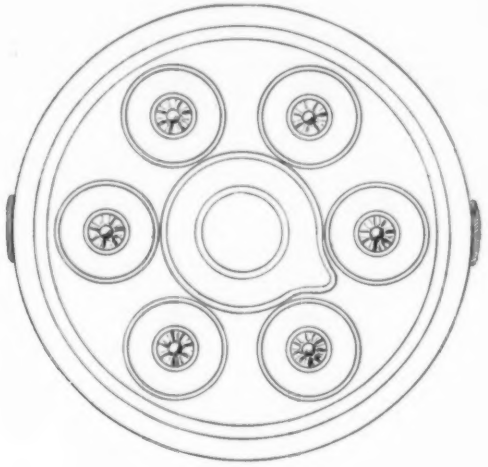


FIG. II.—Vesical bag rolled and clamped with slender forceps ready to be inserted into bladder.



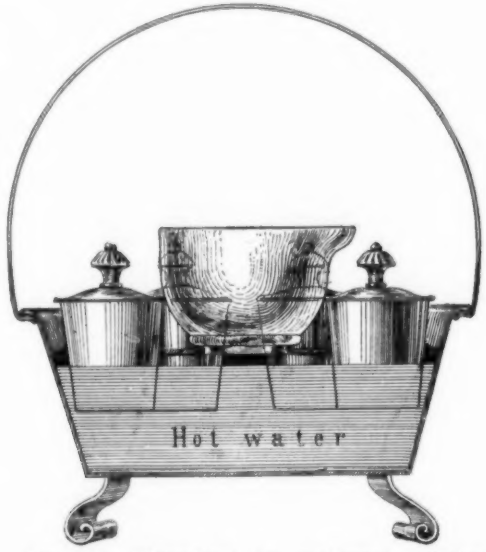


FIG. III.—Water-bath for medicated gelatine. Lower compartment filled with warm water to maintain gelatine in a fluid state. Before rolling vesical bag the gelatine is poured into glass receptacle in center of vessel.

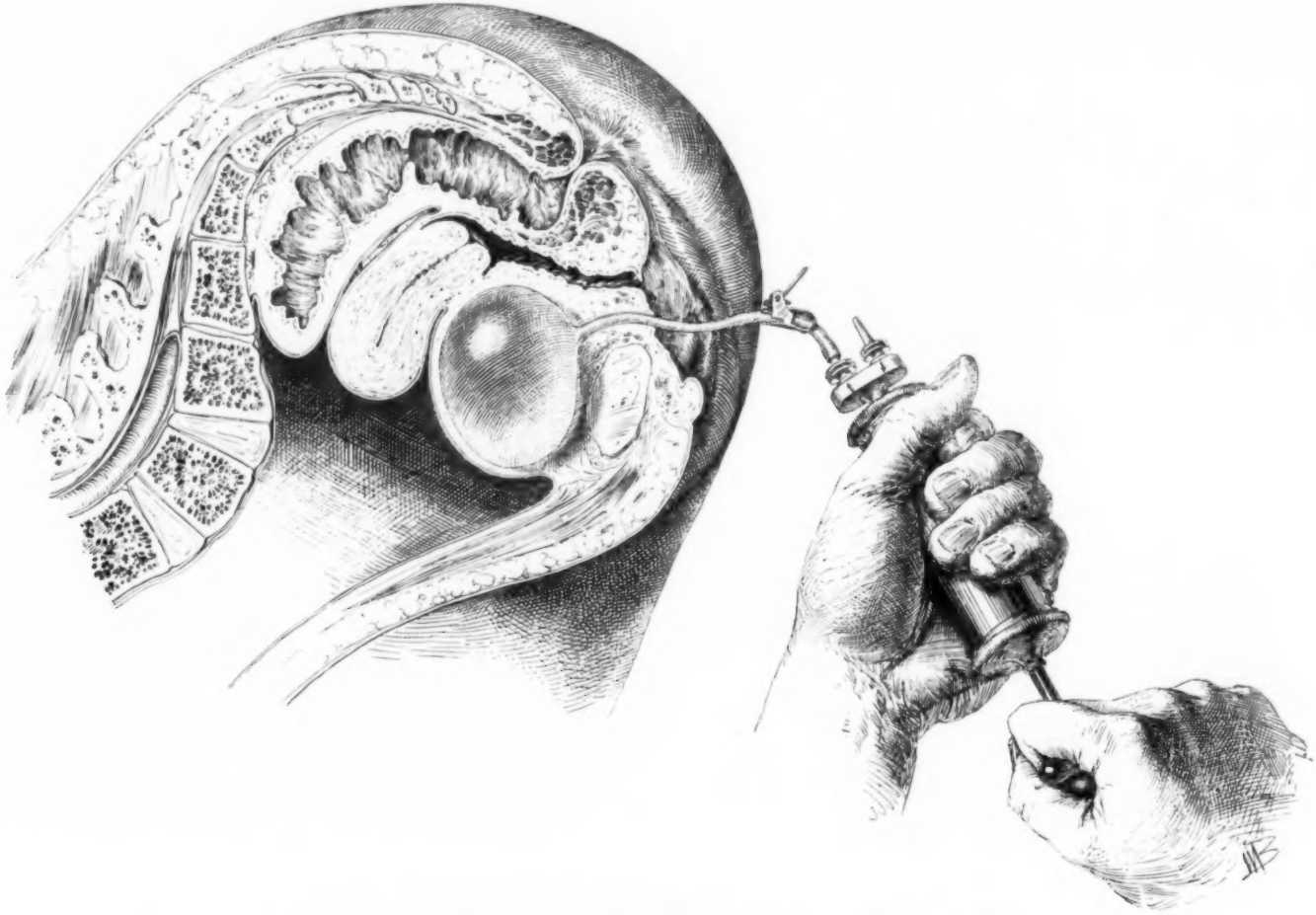


FIG. IV.—Patient in knee-breast posture, vesical bag inserted and inflated.

FIG. V. FIG. VI.

Appearance of trigonum and a part of the posterior wall of the bladder before and after treatment.

germicidal power of juniper oil, introduced it as a sterilizing medium. Later, a large number of cases in his hospital service became infected, and Kocher, feeling that he had such strong evidence against the catgut employed in the cases, published an article against its use in any form, entitled "Fort mit dem Catgut!" (Away with catgut!).

In January, 1893, a very serious reign of infection occurred in the gynecological wards of the Johns Hopkins Hospital which Dr. Kelly believed to be due to catgut prepared by boiling in alcohol under pressure. Unfortunately the whole of the suspected catgut was used up in the last infected case, and consequently bacteriological proof similar to that obtained in Zweifel's cases was wanting. Dr. Kelly was so firmly convinced, however, of its rôle as an infecting agent that he, like Kocher, discarded all catgut, and for the two following years used silk entirely as a suture material.

Many chemical methods of sterilization have been proposed, but all are open to the objections of either failing to render the catgut innocuous, or impairing its tensile strength, or so impregnating the catgut with irritant chemicals that it acts as a local irritant when introduced into living tissue. The most perfect means of sterilization for surgical purposes is unquestionably heat. Until 1888, when Benckisser and Reverdin brought out independently of each other similar methods of sterilization by dry heat, it was considered impossible to raise any form of animal ligature to a temperature sufficient to render it sterile without making it brittle.

Reverdin demonstrated that it was not the oil as previously supposed, but the hygroscopic water in catgut, which caused it to become brittle when heated. If this is driven off by dry heat at a temperature of 70° C. it can be carried safely up to a temperature of 150° C. without impairing its integrity.

Reverdin and Benckisser both made careful bacteriological studies of these methods and found them to be efficient. The complicated apparatus, consisting of a hot-air oven and a thermo-regulator, however, prevented their general adoption.

The observations of these two investigators stimulated others in the right direction and caused them to look for a liquid of a sufficiently high boiling-point to sterilize catgut. Brunner found that the boiling-point of xylol was 136° to 140° C., and at once adopted it as a sterilizing medium.

This at last seemed to be the perfect method, but Krönig found spores occasionally present in catgut which were more resistant than the anthrax spores with which Brunner had experimented, requiring a greater temperature for their destruction than that attained by the boiling xylol. After a further search Krönig found that the boiling point of cumol, a hydrocarbon compound, ranged between 168° and 178° C., and substituted it for xylol.

After a careful review of Krönig's article,* Dr. Kelly decided to return to the use of catgut.

Krönig's method is as follows:

1. Roll the catgut in rings.

2. Dry it in a hot-air oven or over sand-bath for two hours at 70° C.

3. Heat it in cumol to a temperature (165° C.) a little short of the boiling point, for one hour.

4. Transfer it to petroleum benzene for permanent preservation, or, if desirable, leave it in the benzene for three hours and transfer it to sterile Petri dishes.

A bacteriological study of this method by the writers shows that sterilization of catgut by the cumol is perfect, but that the transference from boiling cumol to benzene is open to serious objections.

Bacteriological Study.

The catgut used in the culture experiments was of the largest size (No. 3) used in the Gynecological Department of the hospital. Pieces were cut deeply in many places and immersed in bouillon cultures of the following bacteria: staphylococcus pyogenes aureus, streptococcus pyogenes, bacillus coli communis, bacillus anthracis, bacillus capsulatus (Welch), and bacillus subtilis. The cultures were, with one or two exceptions, 24 hours old at the time of the immersion of the catgut, a few being 4 days old. At the end of 4 to 5 days the pieces of catgut were taken out of the cultures of bouillon, which had been kept in the incubator in the meanwhile. These pieces were then dried in the hot-air oven at a temperature of 80° C. for one hour, and subjected to the cumol sterilization. After boiling for one hour in the cumol they were removed without abstracting the cumol remaining in them. They were placed upon agar either in Petri dishes or tubes, and these placed in the incubator. In every case the culture media upon which they had been placed remained sterile. Pieces of the infected catgut which had been dried but not sterilized were in like manner placed upon agar, as a control. In every instance these gave a growth of the micro-organisms with which they had been infected. In the experiments the staphylococcus pyogenes aureus, bacillus coli communis, bacillus anthracis, and bacillus subtilis were used each four times, the bacillus capsulatus once, and the streptococcus pyogenes once. The latter died either in the bouillon or in the drying process. The staphylococcus pyogenes aureus and bacillus coli communis were used on account of their common occurrence in cases of infection, and the bacillus anthracis and bacillus subtilis on account of the great resistance of their spores to the usual methods of sterilization.

Four experiments were made with the infected catgut to test the germicidal properties of benzene. The catgut was placed in the benzene and allowed to remain 24 hours, then removed and the benzene evaporated at room temperature. In each case the agar upon which this catgut had been placed showed a luxuriant growth of the micro-organism with which the catgut had been infected. The same micro-organisms were used here as in the other experiments except the streptococcus pyogenes and the bacillus capsulatus. A culture was made directly from the commercial benzene and two colonies grew upon the agar. Cover-glasses of these showed a large straight bacillus whose properties were not determined.

Modified Cumol Method.

From the above investigation we found that it was necessary to modify the method of Krönig so as to do away with the

*Centralblatt für Gynäcologie, Juli 7, 1894.

use of benzene, as it is not a germicide and cannot be rendered sterile by heat without great danger. The following method was therefore adopted:

1. Cut the catgut into the desired lengths and roll 12 strands in a figure of eight form so that it may be slipped into a large test tube.

2. Bring the catgut gradually up to a temperature of 80° C., and hold it at this point one hour.

3. Place the catgut in cumol, which must not be above a temperature of 100° C., raise it to 165° C. and hold it at this point for one hour.

4. Pour off the cumol and either allow the heat of the sand-bath to dry the catgut or transfer it to a hot-air oven, at a temperature of 100° C., for two hours.

5. Transfer the rings with sterile forceps to test tubes previously sterilized as in the laboratory.

In making the catgut up into rolls it is only necessary to tie the ends in the isthmus of the figure of eight to hold them securely in proper shape.

If convenient it is better to use the hot-air oven for the drying process, but this is not absolutely essential, as a sand-bath can be improvised, as suggested by Krönig, to serve this purpose.

A beaker glass of at least a half-liter capacity is imbedded three-fourths of its height in a tin or agate-ware vessel of sufficient capacity to permit three-fourths of an inch of sand to be packed about the sides and beneath the glass.

In drying or boiling, the catgut should not come in contact with the bottom or sides of the vessel, but should be suspended on slender wire supports or placed upon cotton loosely packed in the bottom.

During the drying process the beaker glass is covered with a sheet of pasteboard, through which a centigrade thermometer is thrust so that the mercury bulb may be suspended about midway in the vessel. In this way the temperature can be regulated perfectly.

A Bunsen burner is placed under the sand-bath and the temperature in the beaker glass is slowly brought up to 80° C., where it is held for one hour, to dry the catgut. A higher temperature than 100° C., before the catgut is thoroughly dry, renders it brittle; this step in the method must be carried out most carefully.

When the drying process is completed the cumol is poured into the beaker glass and brought up to a temperature of 165° C., a little short of the boiling-point, with two Bunsen burners. A copper wire netting should be placed over the beaker glass to prevent the ignition of the cumol. This temperature is more than sufficient to kill all micro-organisms, and it is not necessary to allow the cumol to boil, which causes unnecessary evaporation (Krönig). The catgut is left for one hour at this temperature, when the cumol is poured off for subsequent use.

Cumol, which is of a clear limpid or slightly yellowish appearance when procured from the chemist, is changed to a brownish color by boiling.

The catgut is allowed to remain in the sand-bath until the excess of cumol is driven off and it appears entirely free from any oily matter. A period of one to two hours is usually sufficient to dry it thoroughly.

From the sand-bath or hot-air oven it is transferred with sterile forceps to sterile test tubes, such as are used for culture media, in which it is preserved from contamination until ready for use. Small quantities should be placed in each tube, to obviate the necessity of opening them too frequently.

In conclusion, it is well to bear in mind that while cumol is not explosive it is very inflammable, and great care should be observed in lifting the wire screen from the beaker glass to prevent drops of the cumol from falling in the flame or on the heated piece of metal on which the sand-bath rests, as it will take fire, flare up and ignite the fluid in the beaker glass. Such an accident has occurred three times in our experience.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

The Treatment of Pyo-ureteritis and Pyonephrosis by Ureteral and Renal Catheters.—Dr. H. A. Kelly.

I want to give this evening a brief resumé of some important work going on in the gynæcological department during the past year, namely, *the treatment of pyo-ureteritis and pyonephrosis by the renal catheter*. In the first place, a word or two as to diagnosis; by means of my cystoscopic apparatus, shown to this society in October, 1893, and the renal catheters first used in April, 1893, I have been able, in all cases with great facility and sometimes in a few minutes, to trace to its source the pus found in the urine of women.

Judging by the number of cases I have met with, pyuria in women appears to be common, and as a rule its source is utterly unknown to the practitioner in charge.

I have found pus in all parts of the urinary tract, from the external urethral orifice up to the kidney. In one case there was an abscess in one of Skene's tubules at the orifice; in two other cases a suburethral abscess discharged into the urethra and filled the vesical speculum with pus as it was drawn out.

In another instance a contracted pelvic abscess opened into the bladder through the right broad ligament; by my cystoscope I could see the opening and run in a sound, and by pressure cause pus to ooze out.

In other cases I have been able to locate the affection in the urinary tract *above the bladder* by getting separated urines from both sides, and examining it bacteriologically and microscopically; a careful examination of the urea will determine the working coefficient of each kidney, a valuable point in the judgment as to the safety of operating.

I want to dwell now more particularly on the treatment of ureteral and renal pyuria by the renal catheter. There are two ways of treating accumulations of pus in the kidney by the renal catheter: *a*) by evacuation; *b*) by washing out.

a) *The treatment actually begins with the first evacuation*

when the pus is drawn off by the catheter, and may be continued either by leaving the catheter in the kidney for several hours (as in one of the first cases, where it was left in from 12.30 p. m. till late in the same evening), or for several days (from Wednesday morning until Sunday evening, in a case now in the house). By leaving the catheter in for a length of time I have been able to evacuate and drain an abscess, and then by introducing the catheter at intervals of one to five days I can keep it well drained. In several patients I have introduced it as often as once daily, in one woman over 120 times in all.

b) *Washing out the kidney.* In each case the kidney has been washed out after evacuating the pus, by a syringe connected to the catheter. I first used simple gravity for this purpose, by connecting the catheter with a funnel by means of a rubber tube. As the funnel was held high or lower, the fluid ran in or out (*v.* JOHNS HOPKINS HOSPITAL BULLETIN, February, 1895).

I have used solutions of 1-150,000 bichloride of mercury and gradually increasing to 1-2500 and in one case even to 1-1000. In some instances I have used boric acid, and in one nitrate of silver. I find that the occasional use of the bichloride solution with the regular use of boric acid solutions gives good results.

Sometimes it only seems necessary to let the pus out to start an improvement. A case in point was that of Miss D., sent to me by Dr. Norment of Baltimore. She had an abscess in the pelvis of the kidney, and another just below the pelvis in the ureter. The lower pocket contained 45 cc. of pus. I evacuated these in my office, and she improved so much that she returned to work and abandoned further treatment.

The washing out may be repeated at intervals of 1 to 4 days, according to the condition of the patient and the way she stands it. This little procedure does not call for anæsthesia. The quantity injected is usually not more than two-thirds that of the fluid withdrawn. In one instance, in using the force-bottle of the aspirator, a quantity was accidentally forced in larger than that which came out, and the patient at once had a severe renal colic. Three women had ureteral chills and fever in the course of the treatment, with nausea and general malaise; there were two or three chills, and a sharp rise in temperature, highest on the second day, gradually subsiding and disappearing by the fourth or fifth day; the initial chill was more marked than the subsequent ones. The temperature went as high as 104 in one case and 103 in another, but no harm resulted, and treatment was continued.

The progress towards recovery is often as follows: After from five to ten catheterizations, the thick creamy pus begins to become watery and of low specific gravity, containing a small amount of urea (0.3 to 0.7 per cent.). Finally the pus disappears, leaving a hydronephrosis of lesser volume than the original pyonephrosis, and later the hydronephrosis too disappears and the condition becomes normal.

I will now briefly cite a few of my cases:

Case 1. Mrs. B had been in the Hospital about a year before for a suspensory operation. At that time she complained of frequent micturition. The urine was examined and the bladder inspected and found normal. She returned a year later, suffering extreme pain in the right loin, with high temperature, and wretchedly depressed. I put her in the knee-breast position, passed a catheter up the ureter into the kidney, but nothing came, as the pus was too thick to flow. I left the catheter in and sent her to the ward, where Doctor Clark attached the aspirator and drew out 280 cc. of thick, greenish pus, of fetid odor. Her kidney was then regularly washed out with bichloride and boric acid solutions, and the urine became clear. One time by mistake a 1-1000 solution was used; she suffered a good deal of pain, but made more improvement than after any previous treatment. She was finally discharged perfectly well after about 12 washings, with clear urine and without pain.

Case 2. Mrs. S. was brought here on a stretcher about four months ago, apparently in the last stages of illness and not far from death. I introduced the renal catheter, made suction on the end, and drew down a large amount of pus, and then washed her kidney out. The bladder specimen, examined at the time of admission, was reddish in color; thick white precipitate; acid; contained a trace of albumen.

Microscopic examination showed the entire field filled with pus cells. No tubercle bacilli found. Urea, one-half normal. Specimen of urine from right ureter, pale lemon color, with lower layer of gray thick sediment and an upper layer of sediment. Quantity too small for chemical examination. Field filled with pus cells. One hyaline cast. Amount of urea, one-fourth the amount of the mixed urine. Urine from left ureter: slight amount of albumen present; few leucocytes; few epithelial cells. Urea three times as much as from the diseased side. She has been washed out regularly, and the kidney, on entrance larger than a child's head, is now quite small; there is no more pus in the urine and she is well. She has gained 15 pounds.

Case 3, Mrs. S., a gonorrhœal stricture low down in the ureter, has been reported in the BULLETIN (February, 1895) and will, therefore, not be reported in detail. Washed out over 120 times, with the result that from containing 150 cc. of pus, the kidney and ureter now contain 90–100 cc. of clear urine. I could not relieve the stricture entirely, and she still has a hydro-ureter.

Case 4, Miss S., was washed out over 100 times. Instead of getting better she got gradually worse. One day on applying suction to the end of the catheter I brought out a couple of black granules which proved to be masses of uric acid. I concluded upon this find that the inefficiency of the washing was due to a mechanical cause, a stone in the kidney, so I cut down and removed a small stone as big as the end of my thumb.

Case 5 was sent to me from Chicago for diagnosis (*v. Med. News*, Nov. 30, 1895). I was able to settle it by drawing out pus and urine through the catheter by suction, together with a number of little black specks and some granular debris; but the smaller specks were apparently of calculus. On withdrawing the catheter, a little calculus, black and mammillated on one side and buff-colored and jagged on the other, was found in its eye. The microscope showed that this was broken off from a larger stone. The end of the catheter also, instead of being smooth and round, was hammered down and angular and the side scraped off. This patient has not been operated on, but there can be no doubt about the correctness of the diagnosis.

Case 6, Miss F., is still in ward H under treatment.

The renal catheters used vary in diameter from 1½ to 3 mm., the average size used being 2–2½ mm. in diameter. If the pus will not flow through the catheter, suction will sometimes bring it.

A valuable plan where suction will not succeed is to inject some boric acid solution, say 15 or 20 cc., and then manipulate the kidney and mix the solution with the pus, and then let it run out with the diluted pus. In the case treated in this way last Wednesday I brought down a large beaker two-thirds full of pus so thick and curdy that you would have supposed it impossible to get it through the ureteral catheter used.

If you doubt whether the catheter actually reached the pelvis of the kidney, I have the following way of demonstrating that it actually was there. These catheters are pliable and easily molded by warmth, and after it has been some time in the kidney and ureter, on laying it on a cold surface as soon as it comes out it takes distinct curves and shows both the point at which it crossed the pelvic brim and the curve at the end where it impinged on the upper part of the pelvis of the kidney and bent over. One catheter taken out of a big abscess in this way gave a good idea of its size and form.

Bacteriological Report of these Cases by Dr. G. B Miller, *Gynecological resident.*

Case 1.—Cultures made (March 30, 1895, and May —, 1895) from the pus obtained from the catheterized ureter, gave the micro-organism described more fully in Case 6. The length of the bacillus varied even more here than in that case, it being frequently 20–30 times the thickness. The pus was not examined microscopically at the time of its catheterization.

Case 2.—Numerous cover-glasses were stained for the bacillus tuberculosis at different times, and proved negative. No cultures were made.

Case 3.—The pus from the catheterized urine was repeatedly examined by Drs. Barker and Stokes. The former found "many diplococci, and these nearly altogether within the protoplasm of the leucocytes; a few within the squamous epithelial cells, and very few outside the cells." He believes "that if gonorrhœa can be diagnosed from pus that this is a case." Dr. Stokes found the same micro-organisms. No other bacteria were found.

Case 4.—The urine drawn from the right ureter was examined by Dr. Barker, who found that the pus when stained showed many bacilli within the protoplasm of the polynuclear leucocytes, also many bacilli in the urine, some being in chains.

Case 5.—No bacteria were reported as being found in the catheterized urine.

Case 6.—The pus from the catheterized ureter (Nov. 12, 1895) showed, when stained, a large coccus occurring singly and in pairs. These were not seen within the pus cells. Cultures from the pus upon glycerine agar proved negative.

Numerous cover-glasses of the pus from the bladder were stained (Oct. 28, 1895) for the bacillus tuberculosis, but proved negative. The same pus stained by the ordinary methods showed bacteria in large quantities. Two forms of micro-organisms were made out: one, a coarse bacillus, straight or very slightly curved, with rounded ends; the other, a coccus occurring in pairs and in short chains, and seen occasionally within the pus cells.

Cultures made from the bladder (Feb. 16, 1895) gave a white waxy growth on agar and glycerine agar raised above the surface and with irregular edges. The organisms did not produce gas with glucose agar, did not liquefy gelatine, but grew in a similar way as upon agar, coagulated and reddened litmus milk, and grew upon potato as a delicate, white, beaded growth. In form, the micro-organism was a coarse, slightly curved bacillus with rounded ends and 5–6 times as long as thick.

Note.—In Cases 1 and 6 the micro-organism does not correspond to any known pathogenic bacillus; whether it was the cause of the suppuration or was introduced into the bladder from the outside is not known, but it is probable that the latter was the case. The extension also from the bladder to the diseased kidney in Case 1 was possible.

HOSPITAL HISTORICAL CLUB.

Meeting of January 13, 1896.

Women in Medicine.—Dr. Kelly.

Dr. Kelly spoke to the Society about Dr. Elizabeth Blackwell's recent book, *Pioneer Work in Opening the Medical Profession to Women.*

Dr. Blackwell is an Englishwoman, born in Bristol, England, in 1821. Her father was an active member of the Independent Church, and upon his removal to the United States in 1832 he became the friend of William Lloyd Garrison and entered zealously into the anti-slavery struggle. Three of his nine children have achieved distinction. Dr. Emily Blackwell was associated with her sister in the practice of surgery in New York, and Henry B. Blackwell, husband of Lucy Stone, has long been known for his untiring efforts in behalf of the enfranchisement of women.

The Blackwell family settled first in New York, but afterwards removed to Cincinnati, and it is here in the West, in the early forties, that Elizabeth Blackwell's struggles to obtain a medical education began. Her father had died insolvent, and the three elder daughters had to support the family by keeping a boarding-school for girls, so that in 1845, when the idea of becoming a physician first took shape in Miss Blackwell's mind, she was twenty-four years old and had yet to earn the money to pay for her medical tuition. She did this by teaching in the South, first in a forlorn Kentucky town and later in the Carolinas.

In 1847 she had saved enough money to begin, and went to Philadelphia, then the chief seat of medical learning in America, where her application for admission was refused in turn by the four medical colleges of that time. Her interviews with the various professors bring out some curious details which well illustrate the muddle of mind with which many intelligent men approach a subject so novel and so revolutionary as advanced education for women. Dr. Warrington, a well-known Quaker physician, and Dr. Pancoast, professor of surgery in the Jefferson Medical College, then the largest medical school in Philadelphia, both approved of a woman's

studying medicine, but they saw no better way for her to enter the medical classes than to disguise herself as a man. Trousseau gave Dr. Blackwell the same advice when she wanted to attend lectures at the École de Médecine in Paris.

The dean of one of the smaller schools, thinking of his pocketbook, frankly replied to the application, "You cannot expect us to furnish you with a stick to break our heads with." Professional rivalry is undoubtedly a serious obstacle to women in medicine, and keener for various reasons than the natural rivalry of man to man, but it is entertaining to read of a professor in a medical school who felt so sure of the rapid practical success of a woman physician that he actually proposed to enter into partnership with Dr. Blackwell, on condition of sharing profits over $5000 on her first year's practice.

Miss Blackwell's application for admission having been refused by the medical schools of both Philadelphia and New York, she procured a list of all the smaller schools in the Northern States, and quite at a venture applied to a round dozen of the best of them at once. The application was accepted by the medical college of Geneva, New York, and Dr. Blackwell was graduated from that institution in 1849, at the top of her class.

An interesting letter in Appendix I, from Dr. Stephen Smith, of New York, explains that the action of the Geneva Medical College in admitting Miss Blackwell was not originally meant to be serious. The faculty did not intend to admit her, but wished to escape direct responsibility by referring the question to the medical class, with the understanding that if a single student objected, out of a total of 150, the application would be refused.

"But," says Dr. Smith, "the whole affair assumed the most ludicrous aspect to the class, and the announcement was received with the most uproarious demonstrations of favor. A meeting was called for the evening, which was attended by every member. The resolution approving the admission of the lady was sustained by a number of the most extravagant speeches, which were enthusiastically cheered. The vote was finally taken, with what seemed to be one unanimous yell, 'Yea!' When the negative vote was called, a single voice was heard uttering a timid 'No.' The scene that followed passes description. A general rush was made for the corner of the room which emitted the voice, and the recalcitrant member was only too glad to acknowledge his error and record his vote in the affirmative. The faculty received the decision of the class with evident disfavor, and returned an answer admitting the lady student. Two weeks or more elapsed, and as the lady student did not appear, the incident of her application was quite forgotten and the class continued in its riotous career. One morning, all unexpectedly, a lady entered the lecture-room with the professor; she was quite small of stature, plainly dressed, appeared diffident and retiring, but had a firm and determined expression of face. Her entrance into that Bedlam of confusion acted like magic upon every student. Each hurriedly sought his seat and the most absolute silence prevailed. For the first time a lecture was given without the slightest interruption, and every word could be heard as distinctly as it would if there had been but a single person in the room. The sudden transformation of the class from a band of lawless desperadoes to gentlemen, by the mere presence of a lady, proved to be permanent in its effects. A more orderly class of medical students was never seen than this, and it continued to be to the close of the term."

After graduation, Dr. Blackwell pursued her studies for several years in Europe,

"Now up, now down, like bucket in a well,"

in her experiences with medical authorities. At St. Thomas's Hospital, London, the surgeon to whom she was introduced thought it very indelicate for a lady to want to study in a hospital, and he simply acknowledged her letter of introduction by a line to one of his nurses, requesting that Dr. Blackwell would not visit any of the men's wards. At St. Bartholomew's Hospital it was the other half of humanity that was excluded from a woman's knowledge; through the courtesy of Sir James Paget she was made welcome to all the wards, "except the department for female diseases"!

Dr. Blackwell's account of her life as a *sage-femme* in the Maternité, Paris, is one of the most interesting chapters of the book. La Maternité was a great state institution, which received young women from every department of France to be trained as midwives. It occupied the old convent of Port Royal, and the discipline was monastic in its simplicity, regularity, and seclusion. The French authorities refused absolutely to make the slightest modification of their rules in favor of a foreigner and a graduate in medicine, and Dr. Blackwell was obliged to enter the Maternité upon the same conditions as the young ignorant French girls. The picture she gives us of the daily life of these French girls is charming. From seven to eight every morning, Madame Charrier, the *aide-sage-femme*, gave a stormy hour of instruction; later, after attending to the mothers and little ones in the wards, there came a second lecture from Dr. Dubois, "a little, bald, grey-haired man, with a clear, gentle voice and a very benevolent face." At 12 o'clock came dinner, followed by the sending up of a "prayer rocket," when the young girls crowded out of the hall, amidst laughing and bustle, each carrying off for breakfast a loaf of bread under her arm and odd little pots of eatables in her hands. A pretty custom was class instruction in the old wood of Port Royal, preparatory lessons which the older *élèves* gave to the younger ones, seated on the grass under the shade of some fine tree. At night a favorite amusement in the *dortoir* was "to promenade the bedsteads"; the bedsteads were of iron on rollers so easily movable that an impulse given to the first bed would set a whole row going. Or perhaps a bedstead would be sent violently down the middle of the room, rolling over the old brick floor of the monks with a tremendous noise, and "accompanied by a regular Babel of laughter, shouting, and jokes of every description."

In the midst of all this the practical work of obstetrics went on, and these gay, ignorant girls were trained as midwives of every degree of efficiency and inefficiency. Elizabeth Blackwell's presence among them was the old system and the new side by side. A sad accident to Dr. Blackwell in the Maternité completely changed her medical ambition. We read on page 157, "I still mean to be at no very distant day the first lady surgeon in the world," and a little further on the

brave woman says simply that she had to abandon her intention of making surgery a specialty. She lost the sight of one eye at La Maternité, from an infection accidentally incurred while syringing the eye of a baby suffering from purulent ophthalmia.

In 1851, Dr. Blackwell established herself in New York, and began to practise under conditions that would have overcome a less courageous spirit. She had no medical countenance whatever, society was distrustful of the innovation, and patients came very slowly. Occasionally she received insolent letters, and unprincipled men spoke to her on the streets when she was called out after nightfall. She took a little orphan girl to live with her, to relieve the loneliness of her life, and an incident in connection with this child shows how severely Dr. Blackwell was let alone by the medical profession of New York. The little girl, who was accustomed to call her "Doctor," happened to be present one day during the visit of a friendly physician. After he was gone the child said, with a puzzled look on her face, "Doctor, how very odd it is to hear a *man* called 'doctor'!"

A passing note records gratefully that Dr. Sims was one of the first physicians to be cordial. He was at the time enlisting support for the foundation of the Woman's Hospital in New York. Dr. Blackwell writes: "He seems to be in favor of women studying medicine. I think I shall help him in any way I can." After a hard struggle for seven years, Dr. Blackwell, who had meanwhile been joined by her sister, Dr. Emily Blackwell, succeeded in establishing the New York Infirmary and College for Women, occupying the chair of hygiene in the college, while Dr. Emily Blackwell became chief surgeon to the infirmary. Dr. Blackwell returned to England in 1869, where she accepted the professorship of gynecology in the London School of Medicine for Women, established by Dr. Elizabeth Garrett Anderson.

It has been a long and useful life, and Dr. Blackwell's modest account of it forms a striking chapter in the history of medicine. She herself dates the end of her pioneer work in 1869, when successful medical colleges for women were in operation in Boston, New York, and Philadelphia, and when some of the older medical colleges for men had opened their doors to women. Just what advances have been made since 1849, when Dr. Blackwell was the only woman in the United States with a medical degree, may be seen by a reference to the Report of the Bureau of Education for 1893. It states that the total enrollment of students in all the medical colleges of the country, for 1892–3, was 28,900, of whom 1302 were women. This would give one woman physician for every twenty-two men. In Russia, which we are wont to think of as a semi-civilized community, the figures are one in twenty-eight. The advancement of women in medicine as in other lines of study and activity during the last twenty-five years has been enormous. No other movement forwards can compare with it in rapidity and force. It is simply another world to live in.

Dr. Blackwell's varied experiences have brought her in contact with many distinguished men and women, and she gives us pleasant glimpses as we read of some of them—Lamartine, Lady Byron, Florence Nightingale, Francis Newman, Charles Kingsley, and others. A letter from Lady Byron, very obscurely expressed, on the magnetoscope, suggests the radical incompatibility of mind between the poet and his wife.

A good story of George Jacob Holyoake is worth recording. At the Bristol Social Science Congress, in 1869, Herman Bicknell gave a "breakfast of all the religions." Holyoake coming in late from a meeting of Bristol workingmen, was greeted by his host with, "Now, Holyoake, pray let us have your famous demonstration of the non-existence of God." Mr. Holyoake thought for some minutes in profound silence, and then burst out, "Upon my word, Bicknell, I have really quite forgotten it."

NOTES ON NEW BOOKS.

Ueber das bacterienfeindliche Verhalten des Scheidensecretes Schwangerer. Von Dr. B. Krönig. Deut. med. Woch., 1894, No. 43.

Menge and Krönig, of Professor Zweifel's clinic in Leipzig, dissatisfied with the discordant views regarding the mode of origin of infectious processes starting out from the genital tract, undertook a thorough bacteriological examination of the vaginal secretion. The labor was divided, Menge studying the secretion in non-pregnant women, Krönig that of women who were pregnant. The latter has given an epitome of his results in the article mentioned above.

Kaltenbach believed that external infection and auto-infection are essentially identical, the two kinds differing from one another only temporarily; while external infection was caused by bacteria introduced during childbirth by the examining finger, auto-infection, on the other hand, was to be attributed to bacteria which during pregnancy or earlier had reached the genital canal and first showed their effects at childbirth or shortly afterwards. According to this idea it was taken for granted that bacteria find in the vaginal secretion a suitable nutrient medium in which they may live for months. This was the view also accepted by Steffeck and Winter.

Ahlfeld believes that every woman harbors in her vagina bacteria which, under suitable conditions, can give rise to fever and lead to the death of the individual. It is his opinion that in well conducted institutions the number of puerperal auto-infections is even greater than that of external infections. That puerperal fever is not universal was explained on the grounds of local predisposition, loss of virulence of the germs, etc. Mermann has even compared the vaginal secretion with the poison sac of a venomous serpent: "Just as a snake is uninjured by its own poison, so the secretion of a pregnant woman is harmless for herself."

Döderlein takes a more intermediate position. He distinguishes normal from pathological vaginal secretions and has spoken in full of their characteristics. Krönig does not believe that Döderlein's classification is justifiable. While there are certainly different kinds of secretion, distinguishable from one another by differences in bacterial flora, Döderlein's view that there is a special normal secretion in which his so-called vaginal bacillus alone is present, can no longer be held, since Krönig has shown the existence of many rods and cocci in secretions along with these vaginal bacilli. Very few of the bacteria which live in the vagina will grow aerobically on neutral or alkaline media. Part of them will grow on acid media, but the majority can be grown only anaerobically. K. has shown that these different forms are as harmless as the vaginal bacillus of Döderlein, and the cocci predominating in some of the secretions have, according to him, certainly nothing to do with the pathogenic staphylococci and streptococci. Döderlein asserted that he found in his so-called "pathological vaginal secretion" bacteria of very different kinds, among them pathogenic forms which would grow out on agar. Krönig's results do not agree with

this. His agar plates always remained sterile, no matter what forms were seen in cover-slips. Every kind of secretion which he met with was free from outside germs, both pathogenic and saprophytic. The doctrine of Kaltenbach that germs from the outside having once gained entrance to the vagina, can live there for months and find in it suitable conditions for growth and further development, is, Krönig says, untrue for any kind of vaginal secretion. Thus, while bacteria from the outside may in various ways be introduced in great numbers into the genital canal, the secretion remains absolutely free of aerobic bacteria if one waits for only a little time after the contamination, before making cultures. The vagina of a pregnant woman is capable either of mechanically removing outside bacteria after they have been introduced or of destroying them.

Krönig submitted the whole subject to bacteriological experiment, and studied the secretions of a large number of pregnant women. By means of sterile tubes, bacteria of different kinds were introduced into the vagina, and afterwards cultures were made at intervals, both from the entrance and from the interior of the vagina, the secretion being removed by means of Menge's vaginal spoon. In no one of the instances did any ill effects result.

In his early experiments he used the bacillus pyocyaneus. This bacterium was placed within the vagina of 20 pregnant women. The secretion in 9 of these had been found to contain vaginal bacilli; in 4 there were short bacilli of different kinds; in 7 cocci predominated. In the first group of cases all the pyocyaneus bacilli had vanished, on an average, after 14½ hours; in the second group after 16 hours; in the third group after 20 hours. The results in the last group appear somewhat less favorable, but the differences lie within the limits of error.

As soon as Krönig had convinced himself of the protective power of the vaginal secretion against the bacillus pyocyaneus, he introduced staphylococci into the cavity under similar conditions and found that they were destroyed even more quickly than the bacilli. Afterwards he made three experiments with streptococci, using pregnant women at the seventh and eighth month. The streptococci were demonstrable for six hours only after introduction.

The results in 48 women can be summed up as follows:

1. No difference in the bactericidal activity of the vaginal secretion can be noticed between the cases in which bacilli predominate and those in which cocci predominate.

2. Considerable differences are met with in the rapidity with which certain bacterial kinds are destroyed by the vaginal secretion. Thus streptococci are killed most quickly, in about half the time required to destroy staphylococci or the pyocyaneus bacilli. The longest time required by the vagina to cleanse itself was about two days.

3. It can, therefore, be established, as a rule, that at the end of two or three days after the last introduction of anything from the outside the vagina of a pregnant woman will again be aseptic.

Upon what factors this natural immunity of the vagina depends does not seem perfectly clear. Krönig believes that several factors play a role, namely:

1. Chemical substances in the secretion, probably the acids.
2. The antagonism of bacteria living in the vagina to imported bacteria.
3. Phagocytosis.
4. Lack of oxygen.

He details his experiments bearing upon the relative value of these different factors.

Since the vaginal bacteria themselves are quite harmless, the only bacteria to be considered by the surgeon are those introduced from the outside. Having determined that the vagina can, as a rule, within a few hours and always at the end of two days complete the destruction of imported bacterial forms, Krönig determined to do some experiments in order to find out the influence of vaginal irrigation upon the length of time required to get rid of outside bacteria. He introduced bacteria in bouillon culture into the vagina and after an hour irrigated with solution of Lysol, first without scrubbing the vaginal wall; in other cases the vaginal walls were thoroughly scrubbed in addition to the irrigation. He found that for 15 hours after this latter procedure the secretion is almost completely arrested, the walls are leathery, and it is even difficult to obtain enough secretion for the experiments. His results show that in the first place the irrigation does not markedly diminish the number of bacteria, and secondly, what is much more important, that thorough antiseptic irrigations impair the natural resisting powers of the vagina itself. He found in a series of cases inoculated with staphylococci and irrigated with Lysol that the foreign bacteria were not completely killed until after a length of time twice as long as when no irrigation at all was practiced. In a case inoculated with streptococci in which the vaginal secretion when left to itself was capable of destroying all the cocci at the end of 6 hours, with Lysol irrigations streptococci could be demonstrated for as long as 30 hours afterwards.

Krönig urges, therefore, the discontinuance of prophylactic irrigations of the vagina at childbirth. They do no good and probably do much harm. Even at the end of labor there should be no irrigation, and Krönig believes that even in those cases where gonorrhœal inflammation of the cervix exists, the results will be better if the surgeon trusts to the disinfectant power of the vagina itself.

Besides the laboratory evidence brought forward, Krönig states that he has clinical evidence in support of the views advanced by himself and Menge. At the Leipzig clinic in some 1500 births, including operative cases, no irrigation has been practiced, and the results, though not ideal, are essentially better than where irrigation was employed.

Krönig thinks that we are now justified in speaking of a true asepsis in obstetrical cases, since he has proved that pathogenic and saprogenic bacteria cannot live in the vaginal secretion of pregnant women. The most important point for the obstetrician to observe is the avoidance of the introduction *near the time of labor* of bacteria from the outside. A careless examination should never be made, since one can never predict exactly the time of onset of labor in any given case.

L. F. B.

Ueber ein bacterienfeindliches Verhalten der Scheidensecrete Nichtschwangerer. Von Dr. K. MENGE, Assistent an der Universitätsfrauenklinik in Leipzig. Aus der Deutsche medicinische Wochenschrift, 1894, Nos. 45–48.

Dr. Menge sets out with the statement that the views concerning the bacteria found in the vagina vary greatly, a consequence of the conflicting results of the investigations undertaken to settle their character. Most of the therapeutic and preventive measures undertaken against gynecological and obstetrical inflammatory diseases of bacterial origin are dependent almost solely upon clinical experience, and a wider bacteriological research is necessary for the solution of the problem. He cites the conflicting views of von Leopold and von Ahlfeld upon the question of auto-infection. He says that it is well known and conclusively proved that the pyogenic bacteria have been found as the cause of puerperal infection and in infection following gynecological operations upon the vagina and uterus; also that the gonococcus exists in and causes certain pathological conditions of the female genital tract. The question then arises whether the pyogenic bacteria can exist in the vaginal tract as facultative saprophytes, and have an existence corresponding to the conditions under which we grow them outside of the human body. If the gonococcus gains entrance to a body surface which is intact, and which has a secretion that acts as a nutrient medium for the micro-organism, it will germinate and increase as soon as it arrives at the proper temperature. It can live only a short time as a saprophyte, but will either cause an inflammation of the underlying tissues or die. If the tissues are so constituted that the micro-organism can gain entrance, it will cause an inflammation which either gets well or becomes chronic. He consequently, from obser-

vation and experiment, lays down the following law: "The gonococcus never lives in the human body through a long time if it uses the physiological secretion alone as a nutrient medium; but its continued presence is due to an inflammation caused by it in the underlying tissues, from which it constantly reappears in the secretions of the parts." The term "gonorrhœal spontaneous infection" would therefore be correct only if the gonococcus could exist as a facultative saprophyte. The fever which occurs in the puerperium in these cases, which in part depends upon the extension of an already existing disease from one part of the genital tract to a larger one, cannot be called "spontaneous" infection, for it is the extension of a condition already existing. The name "auto-infection" would, for the same reason, be incorrect for the fever caused by pyogenic micrococci existing in inflammatory processes going on in the vagina or cervix at labor and afterwards extending to the uterus or the entire body and causing a general infection. Naturally the question next arises: Can the pyogenic bacteria exist in chronic inflammatory processes occurring in the vagina and cervix at the puerperium, and in this way cause a general infection? He believes they cannot, because, first, they are not found in these conditions, or rarely so; and, second, such processes do not correspond to the action of these bacteria in other parts of the body, for here they cause an acute inflammation which either gets well or leads to a general infection. It becomes next necessary to consider the question: Can the pyogenic bacteria exist in the genital tract as facultative saprophytes before labor? The investigations which have been made to settle this question have been dependent upon methods of research which consisted in examining the utero-vaginal canal by means of cultures and cover-glass preparations. Menge adopted a new method, *i. e.* he carried into the vaginal canal the pyogenic bacteria and studied their behavior there. He selected for his experiments women upon whom laparotomies had been performed, and in whom the cervix and vagina had not been included in the operation. As he found quite a difference in the bacteria of the vagina proper and the introitus vaginæ, he used a small spoon, by means of which he could secure the secretion from the vagina without coming in contact with the introitus. Before the introduction of the outside organisms in each case, he made cultures and cover-glass preparations from the vaginal secretion, and also from the introitus. Fifty cases were examined in this way. From the vagina 44 inoculated agar plates remained sterile, and 6 showed a growth; from the introitus vaginæ 48 of the 50 showed growths. In only one case did he find a known pathogenic organism in the vagina, the streptococcus pyogenes. In three cases altogether he found the streptococcus pyogenes at the introitus. The reaction of the secretions was as follows:

Vagina	28 acid.	Introitus	34 acid.
	16 alkaline.		13 alkaline.
	6 amphoteric.		3 amphoteric.

Menge believes that the difference in the reaction is due to variations in the cervical secretion and the secretions from Bartholin's glands. In the 6 cases in which cultures from the vagina grew, the reaction of 3 was acid, 2 alkaline, and 1 amphoteric. The facts brought out here show that Döderlein's belief that it is the vaginal bacillus alone by its acid production which keeps the vagina free from the pyogenic bacteria, is not correct. For 14 cases in whom the secretion showed an alkaline reaction gave no growth upon the agar, and of the 6 cases from the secretion of which microorganisms did grow 3 were acid, 2 alkaline and 1 amphoteric, as stated above. The stained preparations showed numerous bacteria. None were free from cocci; bacilli of various kinds were found also; fine, slender, curved bacilli were in some, the vaginal bacillus of Döderlein in others, and in the largest number were seen short, thick, straight rods. Menge did not attempt to determine the characteristics, etc., of the bacteria found originally within the vagina, but contented himself with observing the fate of bacteria introduced from without. He found the cellular constituents of the secretions to vary considerably; in only a few cases were epithelial cells alone seen, but in the majority leucocytes were also found in varying proportions along with the epithelium.

He made altogether 80 experiments upon 35 women for the purpose of determining the fate of the pyogenic bacteria when introduced into the vagina. In order to change as little as possible the natural condition of the vaginæ he introduced the micro-organisms taken from plate cultures by means of a slender glass rod into the vaginæ and then spread them over the vaginal walls. The experiments were begun with the bacillus pyocyaneus, both on account of its color production and its low pathogenic properties; and when he found that these bacteria invariably underwent destruction in the vagina, he continued his investigations with the staphylococcus pyogenes aureus and the streptococcus pyogenes. He also used a potato bacillus on account of the high resisting properties of its spores. The pyocyaneus was used 23 times, the staphylococcus pyogenes aureus 30 times, and the streptococcus pyogenes 27 times. In every case the vagina freed itself from the introduced bacteria, the average time necessary being 25 hours. At the introitus vaginæ the bacteria remained by several days a longer time than in the vagina proper. He followed the step of the "self-cleaning" process by taking cultures and making stained preparations before the introduction of the bacteria, immediately after and following this at stated short intervals of time. He also tested the reaction of the secretion. These observations showed a destruction of the introduced bacteria beginning immediately and gradually continuing until the vagina regained its original condition. They also showed that immediately after the introduction of outside bacteria there was a marked tendency of the micro-organisms originally inhabiting the vagina to disappear, and as the bacteria introduced disappeared these gradually regained their original numbers. Along with this there was similarly an increase and a corresponding diminution in the number of leucocytes. Phagocytosis was also observed. Very unimportant or no changes occurred in the epithelial cells during the process. He, however, does not think the leucocytes play a very important rôle in the "self-cleaning" process, for some cases in which there was no leucocytosis showed the destruction of the pyogenic bacteria in the same effective way, and in these cases the secretion outside of the body under similar conditions destroyed the bacteria quite as surely.

The next factor considered was the want of oxygen in the vagina, but as the bacteria used were facultative aërobes, this was evidently not very important.

The next thing considered was lactic acid, which Döderlein claims was due to his vaginal bacillus, and to which he (Döderlein) attributed the self-purification of the vagina. That this was not all-important was proved by the self-cleansing power of those vaginæ which contained an alkaline secretion, and also by the power of the secretions, which, though acid, did not contain lactic acid. However, he experimented with solutions of this acid and found it an effective germicide, 0.5 per cent. solution killing streptococci in 24 hours. In order to ascertain which factor in the secretion was of most importance he took equal quantities of a very acid vaginal secretion; some of the samples were sterilized, others were tested in their natural condition. Both sorts were inoculated with bacteria. The unsterilized secretions destroyed the bacteria as before; those which he sterilized lost this power to a large degree. Some of the same secretion which had been rendered alkaline still retained its germicidal power to a marked degree; but upon sterilizing this alkaline secretion the inoculated microorganisms flourished upon it as upon the ordinary nutrient media. These experiments proved that the most potent factor in the cleansing process had been destroyed by sterilization. This fact led him to think of the original bacteria of the vagina and their metabolic products (Stoffwechselproducte), and also of the fluid from the underlying tissues. Some experiments made upon new-born children led him to consider the latter as a factor. These infants were still-born, and the bacteria were introduced in the same way as in his other

cases. The germicidal process began immediately after the introduction and continued until at the end of 50 hours, when the vaginæ were free from the outside micro-organisms. The vaginæ of the new-born when examined before the introduction of the bacteria were found to be of acid reaction, sterile, and containing as cellular elements only epithelial cells. The outside bacteria, *i. e.* the micro-organisms found in the vagina of the grown, only entered towards the end of the germicidal process and hence could have played only a small part in this process. Leucocytosis and phagocytosis were not constant. The absence of so many of the factors possibly concerned in the cleansing process of the vaginæ of adults caused him to think of the tissue juices (Gewebssaft) as one of the possible cleansing elements in the vaginæ of the new-born. He regards the factors of the germicidal process in these cases to be: first, acidity; second, leucocytosis; third, the growing in of the outside bacteria; and, fourth, tissue fluid. He could not prove the latter owing to the impossibility of its separation from the metabolic products of the ingrowing bacteria.

As he reviews the ground over which he has gone he puts the factors as regards importance in the following order: 1. The normal bacterial flora of the vagina and their metabolic products, 2. acidity, 3. tissue fluid, 4. leucocytes, and finally, 5. the want of oxygen. The disturbance of one of these factors lessens the self-cleansing power of the vagina, and a sufficient disturbance or a loss of many of them allows the growth of the pyogenic micro-organisms. He says that there are certain conditions in the female sex in which a longer time than usual is required for this process of self-cleansing, and names them the vaginal secretion of the new-born, the vaginal secretion during menstruation, the vaginal secretion where there is a more profuse cervical or uterine secretion than normal, the increased vaginal secretion without increase in the uterine secretion, the vaginal secretion of women with relaxed vaginal outlets with descensus uteri, and the vaginal secretion of women who have passed the menopause. By comparing these, he thinks in most the reason is obvious, *i. e.* by an increased flow there is a decrease in the acidity and thinning of the vaginal secretion. The reason for the low degree of disinfectant power in the new-born has been previously stated; its cause in the two last-mentioned conditions has not been satisfactorily settled.

Under what conditions then can pyogenic micro-organisms survive in the vagina? He thinks this may be answered as follows: Under circumstances which to a large extent nullify the conditions previously stated, and then when large quantities of these bacteria are introduced. He illustrates this well by a case in which he found the streptococcus in the vagina. The woman had been infected also with the gonococcus, and when he examined her had a gonorrhœal cervical catarrh with an alkaline vaginal secretion. He tried to rid the vagina of the streptococci by various disinfecting solutions. With these he could kill most of the bacteria, but enough always remained to repopulate the vagina afresh. He then cured the cervical catarrh by applications of a zinc chloride solution, and now the vaginal secretion became acid and regained its normal consistency, and the cleansing factors of the vagina proved sufficient in a short time to kill the streptococci.

Menge has made experiments similar to those before mentioned, on a few girls who had not arrived at the age of puberty, and found the same prompt destruction of the introduced bacteria. The markedly acid secretion, the absence of any diluting discharge, and the thick, tenacious cervical secretion, he regards here as potent factors.

Finally he experimented upon 6 women upon whom "total extirpation" with amputation of the cervix had been done, and got the same results. Pyogenic bacteria introduced into the cervix in these cases were destroyed in 12 hours. These facts, alongside of the many culture experiments, etc., made upon the cervical and uterine canals, made him lay it down as a rule, "that the alkaline female genital tract, *i. e.* the cervix and uterus, is germ-free excepting the gonococcus, and that spontaneous infection during birth is impossible."

I would say in confirmation of this law, that cultures have been made and cover-glasses examined from the uterine cavity in about 40 cases in this hospital within the past year, and in no case have any bacteria been found except the gonococcus.

Dr. Menge's work coupled with Krönig's upon pregnant women is of great importance, his experiments complete and his deductions logical. Some of the obvious lessons are: 1. In obstetrical cases there should be as little interference as possible, for the infection in a very large percentage of cases must come from the introduction of the micro-organisms from without; 2. The good results in the gynecological operations upon the vagina and cervix are not so much due to the disinfection of the vagina, which is always incomplete, as to the cleansing power of the female genital tract; 3. In "total extirpation," the futility of disinfecting the cervical canal; 4. The important rôle which the gonococcus must play in inflammatory disease of the genital tract in nulliparous women; and 5. The small percentage of instances of infection in vaginal hysterectomy and kindred operations may in this way be explained.

G. B. M.

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